

PROCEEDINGS
OF THE
AMERICAN SOCIETY
OF
CIVIL ENGINEERS
(INSTITUTED 1852)

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NOVEMBER, 1915

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NEW YORK 1915

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ON VALUATION OF PUBLIC UTILITIES: Frederic P. Stearns, Charles S. Churchill, Leonard Metcalf, William G. Raymond, Henry E. Riggs, Jonathan P. Snow, William J. Wilgus.

TO INVESTIGATE CONDITIONS OF EMPLOYMENT OF, AND COMPENSATION OF, CIVIL ENGINEERS: Nelson P. Lewis, S. L. F. Deyo, Dugald C. Jackson, William V. Judson, George W. Tillson, C. F. Loweth, John A. Bensel.

TO CODIFY PRESENT PRACTICE ON THE BEARING VALUE OF SOILS FOR FOUNDATIONS, ETC.: Robert A. Cummings, Edwin Duryea, Jr., E. G. Haines, Allen Hazen, James C. Meem, Walter J. Douglas.

ON A NATIONAL WATER LAW: F. H. Newell, George G. Anderson, Charles W. Comstock, Clemens Herschel, W. C. Hoad, Robert E. Horton, John H. Lewis, Charles D. Marx, Gardner S. Williams.

ON FLOODS AND FLOOD PREVENTION: C. McD. Townsend, John A. Bensel, T. G. Dabney, C. E. Grunsky, Morris Knowles, J. B. Lippincott, Daniel W. Mead, John A. Ockerson, Arthur T. Safford, Charles Saville, F. L. Sellew.

TO REPORT ON STRESSES IN RAILROAD TRACK: A. N. Talbot, A. S. Baldwin, J. B. Berry, G. H. Bremner, John Brunner, W. J. Burton, Charles S. Churchill, W. C. Cushing, Robert W. Hunt, George W. Kittredge, Paul M. LaBach, C. G. E. Larsson, William McNab, G. J. Ray, Albert F. Reichmann, F. E. Turneaure, J. E. Willoughby.

The House of the Society is open from 9 A. M. to 10 P. M. every day, except Sundays, Fourth of July, Thanksgiving Day, and Christmas Day.

HOUSE OF THE SOCIETY—220 WEST FIFTY-SEVENTH STREET, NEW YORK.

TELEPHONE NUMBER.....1446 Circle.

CABLE ADDRESS....."Ceas, New York."

* Vacancy in chairmanship caused by the death of Austin Lord Bowman.

AMERICAN SOCIETY OF CIVIL ENGINEERS
INSTITUTED 1852

PROCEEDINGS

This Society is not responsible for any statement made or opinion expressed
in its publications.

SOCIETY AFFAIRS

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MINUTES OF MEETINGS

OF THE SOCIETY

October 20th, 1915.--The meeting was called to order at 8.30 P. M.; Director George W. Fuller in the chair; Chas. Warren Hunt, Secretary; and present, also, 97 members and 21 guests.

A paper by F. zur Nedden, Esq., entitled "Induced Currents of Fluids", was presented by the author.

The Secretary read communications on the subject from Messrs. Clemens Herschel and Carl George de Laval, and the paper was discussed by John C. Trautwine, Jr., Assoc. Am. Soc. C. E., and the author.

The following motion was offered:

"That it is the sense of this meeting that the Society take whatever action is necessary to bring before the Bureau of Standards at Washington, and the Engineering Foundation, the desirability of co-

operation among American scientists in experimenting on the subject of viscosity and induced currents of fluids, in order to avoid the duplication of work."

On motion, duly seconded, the matter was referred to the Board of Direction.

The Secretary announced the following transfers by the Board of Direction on September 20th, 1915:

FROM ASSOCIATE MEMBER TO MEMBER

GEORGE HENRY BLISS, Boise, Idaho

FRANK LEMUEL CLAPP, Boston, Mass.

EARLE TALBOT, New York City

JACKSON FRANKLIN WITT, Dallas, Tex.

The Secretary announced the following deaths:

AXEL SAMUEL FREDERICK BERQUIST, of Brooklyn, N. Y., elected Member, June 6th, 1906; died October 6th, 1915.

AUGUSTUS JAY DU BOIS, of New Haven, Conn., elected Junior, July 7th, 1875; Member, October 5th, 1892; died October 19th, 1915.

EDWARD GRAY, of Cripple Creek, Colo., elected Associate Member, May 1st, 1907; Member, December 6th, 1910; died October 2d, 1915.

WILLIAM BYRD KING, of Fort Worth, Tex., elected Member, October 7th, 1896; died October 11th, 1915.

OLAF RIDLEY PIHL, of Pittsburgh, Pa., elected Member, October 2d, 1889; died October 14th, 1915.

OSMAN FRED COLE, of Crossett, Ark., elected Associate Member, September 2d, 1908; died September 27th, 1915.

THOMAS HOVENDEN, of Philadelphia, Pa., elected Associate Member, July 9th, 1912; died September 19th, 1915.

EDWARD WOOLSEY COIT, of Los Angeles, Cal., elected Fellow, September 20th, 1872; died September 25th, 1915.

Adjourned.

November 3d, 1915.—The meeting was called to order at 8.30 p. m.; Mansfield Merriman, M. Am. Soc. C. E., in the chair; Chas. Warren Hunt, Secretary; and present, also, 95 members and 10 guests.

The minutes of the meetings of September 15th and October 6th, and of the Annual Convention, September 16th, 1915, were approved as printed in *Proceedings* for October, 1915.

A paper by Karl R. Kennison, Assoc. M. Am. Soc. C. E., entitled "The Hydraulic Jump, in Open-Channel Flow at High Velocity", was presented by the Secretary, who also read communications on the subject from Messrs. B. F. Groat, H. B. Muckleston, and Frederic P. Stearns.

The paper was discussed also by Messrs. R. D. Johnson, Mansfield Merriman, and H. F. Dunham.

The Secretary announced the following deaths:

EDWARD MACAULAY HARTRICK, of Galveston, Tex., elected Member, February 1st, 1899; died August, 1915.

WALTER COX BOWEN, of New Brunswick, N. J., elected Junior, December 31st, 1913; died May 8th, 1915.

Adjourned.

**ANNUAL CONVENTION
AND
INTERNATIONAL ENGINEERING CONGRESS, 1915**

It was the intention to print in this number of *Proceedings* the Report in full of the Business Meeting of the Convention, together with an account of the Excursions and Entertainments, and also of the International Engineering Congress, 1915, but it has been impossible to do this because some of the necessary information is still lacking. These matters will be published in the December *Proceedings*.

On the following pages a list of the 246 papers to be published by the Congress is printed for the information of the membership.

INTERNATIONAL ENGINEERING CONGRESS, 1915

LIST OF PAPERS TO BE PUBLISHED,
SHOWING THEIR ARRANGEMENT IN ELEVEN VOLUMES.**VOLUME I****Panama Canal****Introductory Paper**

G. W. Goethals, Maj.-Gen., Corps of
Engrs., U. S. A., M. Am. Soc. C. E.,
Canal Zone, Panama.

Outline of Canal Zone Geology

Donald F. MacDonald, Washington,
D. C.

**Climatology and Hydrology of the
Panama Canal**

F. D. Willson.

Sanitation in the Panama Canal Zone

Charles F. Mason, Lt.-Col., Medical
Corps, U. S. A., Canal Zone, Pan-
ama.

**Preliminary Municipal Engineering at
Panama**

Henry Welles Durham, M. Am. Soc.
C. E., New York, N. Y.

**Municipal Engineering and Domestic
Water Supply in the Canal Zone**

George M. Wells, M. Am. Soc. C. E.,
Canal Zone, Panama.

Dry Excavation (Panama Canal)

G. W. Goethals, Maj.-Gen., Corps of
Engrs., U. S. A., M. Am. Soc. C. E.,
Canal Zone, Panama.

Dredging in the Panama Canal

W. G. Comber, M. Am. Soc. C. E.,
Canal Zone, Panama.

**Construction of Gatun Locks, Dam, and
Spillway**

W. L. Libert, Brig.-Gen., Corps of
Engrs., U. S. A., M. Am. Soc. C. E.,
San Francisco, Cal.

**Method of Construction of the Locks,
Dams, and Regulating Works in the
Pacific Division of the Panama Canal**

S. B. Williamson, M. Am. Soc. C. E.,
Denver, Colo.

**Lock Gates, Chain Fenders, and Lock
Entrance Caissons**

Henry Goldmark, M. Am. Soc. C. E.,
New York, N. Y.

VOL. I—(Continued)**The General Design of the Locks, Dams,
and Regulating Works of the Panama
Canal**

H. F. Hodges, Brig.-Gen., Corps of
Engrs., U. S. A., M. Am. Soc. C. E.,
Fort Totten, N. Y.

**Design of the Lock Walls and Valves of
the Panama Canal**

L. D. Cornish, M. Am. Soc. C. E.,
Cincinnati, Ohio.

**The Design of the Spillways of the
Panama Canal**

E. C. Sherman, M. Am. Soc. C. E.,
Boston, Mass.

**Emergency Dams above Locks of the
Panama Canal**

T. B. Mönniche, M. Am. Soc. C. E.,
Canal Zone, Panama.

**Hydraulics of the Locking Operations of
the Panama Canal**

R. H. Whitehead, Assoc. M. Am. Soc.
M. E., Canal Zone, Panama.

**The Reconstruction of the Panama
Railroad**

Frederick Mears, Lieut., U. S. A., M.
Am. Soc. C. E., Washington, D. C.

**Permanent Shops, Pacific Terminals—
Panama Canal**

H. D. Hinman, Assoc. M. Am. Soc.
C. E., and A. L. Bell, Assoc. M.
Am. Soc. M. E., Canal Zone, Pan-
ama.

**Electrical and Mechanical Installations
of the Panama Canal**

Edward Schildhauer, M. Am. Soc.
C. E., Fel. Am. Inst. E. E., M. Am.
Soc. M. E., New York, N. Y.

**Terminal Works, Dry Docks, and
Wharves of the Panama Canal**

H. H. Rousseau, Civil Engr., U. S. N.,
Assoc. M. Am. Soc. C. E., Canal
Zone, Panama.

Note:—The general fee for membership in the Congress (\$5.00) covers the index volume and one additional volume. Other volumes may be purchased on a sliding scale of prices: one extra volume costing \$3.50 in paper covers (\$3.75 in cloth), two volumes, \$6.75 in paper (\$7.25 in cloth), etc.

Applications for membership in the Congress will be received until the latter part of December, 1915, and should be addressed to William A. Cattell, Secretary, International Engineering Congress, 1915, Foxcroft Bldg., San Francisco, Cal., who will gladly answer further inquiries.—(*Secretary*.)

VOL. I—(Continued)

Coaling Plants and Floating Cranes of the Panama Canal

F. H. Cooke, Civil Engr., U. S. N.,
M. Am. Soc. C. E., Canal Zone,
Panama.

Aids to Navigation of the Panama Canal
W. F. Beyer, Milwaukee, Wis.

The Working Force of the Panama Canal
R. E. Wood, Maj., U. S. A., Ret.,
Wilmington, Del.

Purchase of Supplies for the Panama Canal

F. C. Boggs, Maj., Corps of Engrs.,
U. S. A., M. Am. Soc. C. E., Wash-
ington, D. C.

Commercial and Trade Aspects of the Panama Canal

Emory R. Johnson, Philadelphia, Pa.

VOLUME II

Waterways and Irrigation

WATERWAYS

The Province of Waterways in the Internal Commerce and Development of a Country

W. H. Bixby, Brig.-Gen., Corps of
Engrs., U. S. A., Ret., M. Am. Soc.
C. E., Washington, D. C.

Artificial Waterways which form Cut-offs on Marine Routes, and Waterways consisting of Natural Channels and Bodies of Water linked by Artificial Channels, constituting Inside Routes

C. S. Riché, Lt.-Col., Corps of Engrs.,
U. S. A., M. Am. Soc. C. E., Wash-
ington, D. C.

The Waterway from the German Rhine through the Netherlands to the North Sea along the Rivers Rhine, Waal, and Nieuwe Maas

C. A. Jolles, Arnhem, The Netherlands.

Natural Waterways in the United States

W. W. Harts, Lt.-Col., Corps of
Engrs., U. S. A., M. Am. Soc. C. E.,
Assoc. M. Inst. C. E., Washington,
D. C.

Flood Control

H. M. Chittenden, Brig-Gen., Corps
of Engrs., U. S. A., Ret., M. Am.
Soc. C. E., Seattle, Wash.

Flood Control in China

Charles Davis Jameson, M. Am. Soc.
C. E., Washington, D. C., and
Peking, China.

Works for the Improvement of Navigable Estuaries

Luigi Luiggi, M. Am. Soc. C. E., M.
Inst. C. E., President, Italian Soc.
C. E., Rome, Italy.

VOL. II—(Continued)

River Improvement Works in Japan
Tadao Okino, Japan.

IRRIGATION

Irrigation Enterprise in the United States
C. E. Grunsky, M. Am. Soc. C. E.,
San Francisco, Cal.

Economic Advisability of Irrigation

F. H. Newell, M. Am. Soc. C. E.,
Urbana, Ill.

Distribution Systems, Methods, and Appliances in Irrigation

J. S. Dennis, M. Can. Soc. C. E.;
H. B. Mucklestone, M. Am. Soc.
C. E., M. Can. Soc. C. E., Calgary,
Alberta, Canada; and Robert S.
Stockton, M. Am. Soc. C. E., M.
Am. Inst. M. E., Strathmore, Al-
berta, Canada.

Utilization of Underground Waters

G. E. P. Smith, M. Am. Soc. C. E.,
Tucson, Ariz.

The Co-relation between Demand and Supply, in view of the Variation between Annual Demand and Supply from Natural Flow, which leads up to a study of the amount of Storage necessary

L. C. Hill, M. Am. Soc. C. E., Los
Angeles, Cal.

Duty of Water in Irrigation

Samuel Fortier, M. Am. Soc. C. E.,
Washington, D. C.

Drainage as a Correlative of Irrigation

C. G. Elliott, M. Am. Soc. C. E.,
Washington, D. C.

Italian Irrigation

Luigi Luiggi, M. Am. Soc. C. E.,
M. Inst. C. E., Pres., Italian Soc.
C. E., Rome, Italy.

Irrigation in Lybia (Italian Colony)

Luigi Luiggi, M. Am. Soc. C. E.,
M. Inst. C. E., Pres., Italian Soc.
C. E., Rome, Italy.

Irrigation in India

M. Nethersole, Simla, India.

The Distribution of Water in Irrigation in Australia

Elwood Mead, M. Am. Soc. C. E., M.
Inst. C. E., Melbourne, Victoria,
Australia.

Irrigation in Spain; Distribution Systems, Methods, and Appliances

J. C. Stevens, M. Am. Soc. C. E.,
Portland, Ore.

Irrigation in Spain; Regulations Controlling the Use of Water, Metering Water for Irrigation, and Methods of Charging

J. C. Stevens, M. Am. Soc. C. E.,
Portland, Ore.

VOL. II—(Continued)**The Problem of Irrigation in the Argentine Republic**

Carlos Wauters, M. Am. Soc. C. E., M. Inst. C. E., Buenos Aires, Argentine Republic.

Dams

Arthur P. Davis, M. Am. Soc. C. E., Washington, D. C.; and D. C. Henny, M. Am. Soc. C. E., Portland, Ore.

Earthen Dams

William Lumisden Strange, M. Inst. C. E., Worthing, England.

VOLUME III**Municipal Engineering****City Planning**

Nelson P. Lewis, M. Am. Soc. C. E., New York, N. Y.

London Traffic in 1913

Sir Albert Stanley, London, England.

Transit Problem in American Cities

W. F. Reeves, M. Am. Soc. C. E., New York, N. Y.

Recent Progress and Tendencies in Municipal Water Supply in the United States

J. W. Alvord, M. Am. Soc. C. E., Chicago, Ill.

Municipal Water Supply in France, Belgium, Algeria-Tunisia

E. Imbeaux, Paris, France.

Water Supply in Japan

S. Inoue, Yokohama, Japan.

The Disposal of Suspended Matters in Sewage

Rudolph Hering, M. Am. Soc. C. E., New York, N. Y.

Sewerage for Low Countries with Special Regard to the Town of Amsterdam

A. W. Bos, Amsterdam, The Netherlands.

Streets

George W. Tillson, M. Am. Soc. C. E., Brooklyn, N. Y.

Rural Highways

L. W. Page, M. Am. Soc. C. E., Washington, D. C.

Rural Highways

L. Limasset, Paris, France.

Construction and Maintenance of Rural Highways

Alfred Dryland, M. Inst. C. E., Kingston-upon-Thames, England.

Rural Highways

Arthur Gladwell, M. Inst. Municipal and County Engrs., Eaton, England.

VOL. III—(Continued)**"Soliditit" Concrete Roads in Italy**

Luigi Luigi, M. Am. Soc. C. E., M. Inst. C. E., Pres., Italian Soc. C. E., Rome, Italy.

Thermal and Traffic Effects on Street Pavements

James E. Howard, M. Am. Soc. Test. Mat., Washington, D. C.

The Struggle Against Dust

C. C. Dassen, Buenos Aires, Argentine Republic.

Fire Protection

John R. Freeman, M. Am. Soc. C. E., Past-Pres. Am. Soc. M. E., Providence, R. I.

Arch Bridges of Hooped Cast Iron

Fritz von Emperger, Vienna, Austria.

Utilities

A. C. Humphreys, M. Am. Soc. C. E., Past-Pres. Am. Soc. M. E., and Am. Gas Inst., M. Inst. C. E., M. Am. Inst. E. E., New York, N. Y.

Public Utilities

Edward Willis, Assoc. M. Inst. C. E., Chiswick, England.

VOLUME IV**Railway Engineering****Railways**

William Barclay Parsons, M. Am. Soc. C. E., M. Inst. C. E., New York, N. Y.

The Status of the Railways of North and South America

F. Lavis, M. Am. Soc. C. E., New York, N. Y.

Italian Railways

Luigi Luigi, M. Am. Soc. C. E., M. Inst. C. E., Pres., Italian Soc. C. E., Rome, Italy.

The Status of Indian Railways

Victor Bayley, Assoc. M. Inst. C. E., Simla, India.

The Status of Chinese Railways

Charles Davis Jameson, M. Am. Soc. C. E., Washington, D. C., and Peking, China.

The Status of Russian Railways

V. A. Nagrodsky, Petrograd, Russia.

The Status of Railways and Tramways in the Netherlands East-Indies

E. P. Wellenstein, The Hague, The Netherlands.

Economic Considerations controlling and governing the Building of New Lines

John F. Stevens, M. Am. Soc. C. E., New York, N. Y.

VOL. IV—(*Continued*)

The Locating of a New Line

William Hood, M. Am. Soc. C. E.,
San Francisco, Cal.

The Locating of a New Line

David Wilson, Assoc. M. Inst. C. E.,
Johannesburg, South Africa.

Tunnels

Charles S. Churchill, M. Am. Soc.
C. E., M. Inst. C. E., Past-Pres.,
Am. Ry. Eng. Assoc., Roanoke, Va.

Tunnels in Italy

Luigi Lulggi, M. Am. Soc. C. E.,
M. Inst. C. E., Pres., Italian Soc.
C. E., Rome, Italy.

Tunnels in Switzerland

R. Winkler, Berne, Switzerland.

Railroad Terminals

B. F. Cresson, Jr., M. Am. Soc. C. E.,
M. Am. Inst. M. E., M. Inst. C. E.,
Trenton, N. J.

Signals and Interlocking

Charles Hansel, M. Am. Soc. C. E.,
New York, N. Y.

Railway Construction Methods and
Equipment

F. C. Hitchcock, M. Am. Soc. C. E.,
New York, N. Y.

Railway Construction Methods and
Equipment in Australia

Maurice E. Kornot, M. Am. Soc. C. E.,
M. Inst. C. E., Victoria, Australia.

Track and Roadbed

George H. Pegram, M. Am. Soc. C. E.,
New York, N. Y.

American Railroad Bridges

J. E. Greiner, M. Am. Soc. C. E.,
Baltimore, Md.

Recent Locomotive Development

George R. Henderson, M. Am. Soc.
M. E., Philadelphia, Pa.

Rolling Stock (other than Motive Power)

A. Stucki, M. Am. Soc. M. E., Pres.,
Engrs. Soc. W. Pa., Pittsburgh,
Pa.

The Floating Equipment of a Railroad

F. L. DuBosque, M. Soc. N. A. and
M. E., New York, N. Y.

Electric Motive Power in the Operation
of Railroads

William Hood, M. Am. Soc. C. E.,
San Francisco, Cal.

Electric Motive Power in the Operation
of Railroads

E. H. McHenry, M. Am. Soc. C. E.,
M. Can. Soc. C. E., New Haven,
Conn.

VOLUME V

Materials of Engineering Con-
struction

Structural Timber in the United States

H. S. Betts, Madison, Wis.; and
W. B. Greeley, Washington, D. C.

Timber in Canada

R. H. Campbell, Ottawa, Ont., Can-
ada.

Indian Timbers used in Engineering Con-
struction

R. S. Pearson, Dehra Dun, India.

Timber in Russia

N. Tkatchenko, Petrograd, Russia.

Preservative Treatment of Timber

Howard F. Weiss, and Clyde H.
Teesdale, Madison, Wis.

Clay Products as an Engineering Mate-
rial

A. V. Bleininger, Pittsburgh, Pa.

Aggregates for Concrete

Sanford E. Thompson, M. Am. Soc.
C. E., M. Am. Soc. M. E., Newton
Highlands, Mass.

Probable and Presumptive Life of Con-
crete Structure Made from Modern
Cements

Bertram Blount, London, England.

Volume Changes in Concrete

Alfred H. White, Ann Arbor, Mich.

Waterproof Concrete

Richard L. Humphrey, M. Am. Soc.
C. E., M. Inst. C. E., M. Soc. C. E.
of France, Philadelphia, Pa.

Use of Wood and Concrete in Structures
standing in Sea Water, with Special
Reference to Dock Work

Harrison S. Taft, M. Pac. N. W. Soc.
of Engrs., Seattle, Wash.

The Outlook for Iron

James Furman Kemp, Past-Pres. and
Hon. M. Am. Inst. M. E., New
York, N. Y.

Alloy Steels in Bridgework

J. A. L. Waddell, M. Am. Soc. C. E.,
Kansas City, Mo.

The Economics of the World's Supply of
Copper

Thomas T. Read, M. Am. Inst. M. E.,
San Francisco, Cal.

Consumption of Copper and its Various
Uses

Thomas T. Read, M. Am. Inst. M. E.,
San Francisco, Cal.; and H. D.
Hawks, New York, N. Y.

Alloys and Their Use in Engineering
Construction

W. Reuben Webster, M. Am. Soc.
M. E., Bridgeport, Conn.

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The Engineering Uses of Aluminum
Joseph W. Richards, M. Am. Inst.
M. E., South Bethlehem, Pa.

Testing of Materials

R. G. Batson, Assoc. M. Inst. C. E.,
Teddington, England.

Testing Full Size Members

Gaetano Lanza, M. Am. Soc. M. E.,
Philadelphia, Pa.

VOLUME VI**Mechanical Engineering****Recent Advances and Improvements in Founding**

Thomas D. West,* M. Am. Soc. M. E.,
Cleveland, Ohio.

Forgings from Early Times until the Present

C. von Philip, M. Am. Soc. M. E.,
South Bethlehem, Pa.

Recent Progress and Present Status of the Art of Forging, with Special Reference to the Use of Quick-Acting Forging Presses

A. J. Capron, M. Inst. C. E., Sheffield, England.

Machine Shop Equipment, Methods and Processes

E. R. Norris, M. Am. Soc. M. E.,
East Pittsburgh, Pa.

Machine Shop Equipment, Methods and Processes

H. F. L. Orcutt, Rowington, Warwickshire, England.

Automatics

R. E. Flanders, M. Am. Soc. M. E.,
Springfield, Vt.

High Temperature Flames in Metal Working

H. R. Swartley, Jr., Jersey City, N. J.

The Internal Combustion Engine of the Year 1915. The Gas Power System. A Survey of its Status in the Year 1915

Charles Edward Lucke, M. Am. Soc. M. E., New York, N. Y.

The Development of the Construction of Turbines in the Netherlands

D. Dresden, Hengelo, The Netherlands.

The 1915 Steam Turbine

E. A. Forsberg, Stockholm, Sweden.

The Diesel Engine in America

Max Rotter, M. Am. Soc. M. E., St. Louis, Mo.

The Boiler of 1915

Arthur D. Pratt, New York, N. Y.

*Deceased since the preparation of the paper.

VOL. VI—(Continued)**Equipment, Processes and Methods for Boiler Shop**

E. C. Meier, Phoenixville, Pa.

Compressed Air in the Arts and Industries

W. L. Saunders, M. Am. Soc. C. E., Pres., Am. Inst. M. E., M. Am. Soc. M. E., New York, N. Y.

Safety Engineering

Frederic Remsen Hutton, Past-Pres. and Hon. Secy. Am. Soc. M. E., New York, N. Y.

Motor Vehicles; Passenger Type

Etheberl Favary, M. Soc. Auto. Engrs., M. Aero. Soc., New York, N. Y.

Motor Vehicles; Utility Type

A. J. Slade, M. Am. Soc. M. E., M. Soc. Auto. Engrs., Assoc. M. Am. Inst. E. E., New York, N. Y.

Motor Tractors

F. S. Davis, M. Soc. Auto. Engrs., Chicago, Ill.

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Economics of Electric Power Station Design**

H. F. Parshall, M. Inst. C. E., London, England.

Industrial Effect of Low Cost of Electric Energy

L. A. Ferguson, Past-Pres., Am. Inst. E. E., Chicago, Ill.

The Effect of Hydro-electric Power Transmission upon Economic and Social Conditions, with Special Reference to the U. S. of America

Frank G. Baum, M. Am. Soc. C. E., M. Am. Soc. M. E., M. Am. Inst. E. E., San Francisco, Cal.

The Electric Motor as an Economic Factor in Industrial Life

David B. Rushmore, M. Am. Soc. C. E., M. Am. Inst. E. E., M. Am. Soc. M. E., M. Am. Inst. M. E., Schenectady, N. Y.

The Influence of the Electric Motor on Machine Tools

A. L. De Leeuw, M. Am. Soc. M. E., Elizabethport, N. J.

Electric Welding

C. B. Auel, M. Am. Soc. M. E., Pittsburgh, Pa.

The Application of Electricity to the Heating of Metals

F. L. Bishop, M. Am. Inst. E. E., Pittsburgh, Pa.

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G. M. Eaton, M. Am. Inst. E. E.,
East Pittsburgh, Pa.

Effects of Electrolysis on Engineering Structures

Albert F. Ganz, Fel. Am. Soc. M. E.,
Hoboken, N. J.

On the Production of High Permeability in Iron

Ernest Wilson, London, England.

Electric Illuminants

S. H. Blake, M. Am. Inst. E. E.,
M. Illum. Eng. Soc., Assoc. M.
Am. Inst. E. E., Schenectady, N. Y.

HYDRAULIC AND HYDRO-ELECTRIC POWER DEVELOPMENT

The Water Power of Sweden

Sven Lübeck, Pres., Svenska Teknologföreningen, Stockholm, Sweden.

Electric Power in Canadian Industry

Charles H. Mitchell, M. Am. Soc.
C. E., M. Inst. C. E., M. Can. Soc.
C. E., Toronto, Ont., Canada.

Developments in Modern Water Turbine Practice

H. Zoelly, M. Soc. Swiss Engrs. and
Archts., Zürich, Switzerland.

Water Wheels of Pressure Type

Arnold Pfau, M. Am. Soc. M. E., Mil-
waukee, Wis.

Hydraulic Power Development and Use

J. D. Galloway, M. Am. Soc. C. E.,
San Francisco, Cal.

Water Wheels of Impulse Type

W. A. Doble, M. Am. Soc. C. E., M.
Am. Soc. M. E., V. D. I., M. Int.
Soc. Test. Mat., San Francisco, Cal.

Canadian Hydraulic Power Development

Charles H. Mitchell, M. Am. Soc.
C. E., M. Inst. C. E., M. Can. Soc.
C. E., Toronto, Ont., Canada.

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Mining Engineering

Economic and Social Influence of Mining

W. H. Shockley, F. R. G. S., M. Am.
Inst. M. E., M. M. and M. Soc. of
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don, Palo Alto, Cal.

Valuation of Metal Mines and Prospects

T. A. Rickard, A. R. S. M., M. Am.
Inst. M. E., M. Inst. M. and M.
San Francisco, Cal.

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erties**

M. E. Lombardi, M. Am. Inst. M. E.,
San Francisco, Cal.

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Valuation of Anthracite Mines

R. V. Norris, M. Am. Soc. C. E., M.
Am. Inst. M. E., M. Am. Soc. M. E.,
Wilkes-Barre, Pa.

Valuation of Coal Lands

Samuel A. Taylor, M. Am. Soc. C. E.,
M. Am. Inst. M. E., Pittsburgh, Pa.

Evaluating Coal Properties in Western Canada

R. W. Coulthard, Calgary, Alberta,
Canada.

Status of Coal Mines in France

E. Gruner, Paris, France.

Workmen's Compensation and Mine Safety

H. M. Wilson, M. Am. Soc. C. E.,
M. Am. Inst. M. E., Pittsburgh, Pa.

Functions and Work of Exploration and Development Companies

H. W. Turner, M. Am. Inst. M. E.,
San Francisco, Cal.

The Financing of Mines in the United States

Lucius W. Mayer, New York, N. Y.

European Mining Finance

J. L. Gallard, London, England.

Organization and Staff of Mining Companies

W. H. Shockley, F. R. G. S., M. Am.
Inst. M. E., M. M. and M. Soc. of
Am., M. Inst. M. and M. of Lon-
don, Palo Alto, Cal.; and R. E.
Cranston, M. Am. Inst. M. E., M.
Am. Soc. M. E., San Francisco, Cal.

Relation of Governments to Mining

Horace V. Winchell, M. Am. Inst.
M. E., Minneapolis, Minn.

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J. W. Paul, Pittsburgh, Pa.

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Metallurgy

Symposium on Iron and Steel

Edited by Henry M. Howe, M. Am.
Inst. M. E., Bedford Hills, N. Y.

Iron and Steel Castings

John Howe Hall, M. Am. Inst. M. E.,
M. Am. Soc. Test. Mat., High
Bridge, N. J.

The Duplex Process of Steel Manufacture

F. F. Lines, M. Am. Inst. M. E., Spar-
rows Point, Md.

Steel Making in the Electric Furnace

James H. Gray, M. Am. Inst. M. E.,
New York, N. Y.

Methods of Preventing Piping in Steel Ingots

Emil Gathmann, M. Am. Inst. M. E.,
Baltimore, Md.

VOL. IX—(Continued)**Steel Alloys**

George L. Norris, Pittsburgh, Pa.

Case Hardening of Steel

F. Giolitti, Turin, Italy.

Metallography and the Hardening of Steel

Albert Sauveur, M. Am. Inst. M. E., Cambridge, Mass.

Symposium on Copper

Edited by E. P. Mathewson, M. Am. Inst. M. E., Anaconda, Mont.

Progress in Copper Metallurgy

Thomas T. Read, M. Am. Inst. M. E., San Francisco, Cal.

Metallurgy of Copper in Japan

R. Kondo, M. Am. Inst. M. E., Tokyo, Japan.

Copper Metallurgy of the Southwest

James Douglas, Past-Pres. and Hon. M. Am. Inst. M. E., New York, N. Y.

Advances made in the Metallurgy of Copper, Globe District, Arizona

L. O. Howard, M. Am. Inst. M. E., Globe, Ariz.

Advances in Copper Smelting

Frederick Laist, M. Am. Inst. M. E., Anaconda, Mont.

Improvements in Design and Construction of Modern Copper Plants

Charles H. Repath, M. Am. Soc. M. E., Los Angeles, Cal.

Reduction Works—Copper Queen Consolidated Mining Company, Douglas, Arizona

Forest Rutherford, M. Am. Inst. M. E., Douglas, Ariz.

The Development of Electrolytic Copper Refining

Lawrence Addicks, M. Am. Soc. M. E., M. Am. Inst. M. E., Assoc. Am. Inst. E. E., Pres. Am. Electrochem. Soc., New York, N. Y.

Electrolytic Refined Copper

A. C. Clark, M. Am. Inst. M. E., Perth Amboy, N. J.

Leaching Copper Ores

W. L. Austin, M. Am. Inst. M. E., Riverside, Cal.

Physical Properties of Copper

Carle R. Hayward, M. Am. Inst. M. E., Boston, Mass.

Boronized Cast Copper

E. Weintraub, West Lynn, Mass.

The Metallography of Copper

William Campbell, M. Am. Inst. M. E., New York, N. Y.

VOL. IX—(Continued)*Symposium on Gold and Silver*

Edited by C. W. Merrill, M. Am. Inst. M. E., San Francisco, Cal.

Coarse Crushing Plant; 1 000 tons Capacity

G. O. Bradley, San Francisco, Cal.

Crushing and Grinding

L. D. Mills, M. Am. Inst. M. E., and M. H. Kuryla, M. Am. Inst. M. E., San Francisco, Cal.

Solution of Gold and Silver

M. H. Kuryla, M. Am. Inst. M. E., San Francisco, Cal.

Filtration or Separation of Metal Bearing Solution from Slime Residue

L. D. Mills, M. Am. Inst. M. E., San Francisco, Cal.

Precipitation

G. H. Clevenger, M. Am. Inst. M. E., Leland Stanford Jr. University, Cal.

The Smelting and Refining of Lead

H. O. Hofman, M. Am. Inst. M. E., Boston, Mass.

Symposium on the Metallurgy of Zinc

Edited by Walter Renton Ingalls, M. Am. Inst. M. E., New York, N. Y.

Some Main Points in the Economics of the Metallurgy of Zinc

Walter Renton Ingalls, M. Am. Inst. M. E., New York, N. Y.

The Development of Zinc Smelting in the United States

George C. Stone, New York, N. Y.

Ore Dressing

Robert H. Richards, M. Am. Inst. M. E., Boston, Mass.

Electro-Metallurgy

E. F. Roeber, M. Am. Inst. M. E., New York, N. Y.

Metallography and Technology of Non-Ferrous Alloys

William Campbell, M. Am. Inst. M. E., New York, N. Y.

Symposium on the Utilization of Fuels in Metallurgy

Edited by C. H. Fulton, M. Am. Inst. M. E., Cleveland, Ohio.

Pulverized Coal in Reverberatory Furnaces

D. H. Browne, M. Am. Inst. M. E., New York, N. Y.

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Burning Pulverized Coal in Copper Marine Boilers and Boiler Room Equipment
Reverberatories

E. P. Mathewson, M. Am. Inst. M. E.,
Anaconda, Mont.

Gas Producer Development

Z. C. Kline, Central Falls, R. I.

Surface Combustion (What is it?)

C. E. Lucke, M. Am. Soc. M. E.,
New York, N. Y.

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Ship Calculation, Resistance and Propulsion

D. W. Taylor, Chf. Constructor,
U. S. N., M. Soc. N. A. and M. E.,
Washington, D. C.

Ocean Freighters

Ernest H. Rigg, M. Inst. N. A., M.
Soc. N. A. and M. E., Camden, N. J.

Recent Developments in Japanese Ship-building

E. Terano, Tokyo, Japan.

Bulk Freight Vessels of the Great Lakes

Herbert C. Sadler, M. Soc. N. A. and
M. E., Ann Arbor, Mich.

River, Lake, Bay, and Sound Steamers of the United States

Andrew Fletcher, M. Soc. N. A. and
M. E., Hoboken, N. J.

Special Types of Cargo Steamers for the United States Coast to Coast Trade Through the Panama Canal

George W. Dickie, Vice-Pres. Am.
Soc. M. E., Vice-Pres. Soc. N. A.
and M. E., San Francisco, Cal.

The Development of the Sail Yacht, Steam Yacht, and Motor Yacht in American Waters

William Gardner, M. Soc. N. A. and
M. E., New York, N. Y.

The Lightship

George Crouse Cook, M. Inst. N. A.,
Washington, D. C.

Warships of the First Line of Battle

Col. E. Ferretti, Naples, Italy.

The Submarine

R. H. M. Robinson, M. Soc. N. A.
and M. E., Bridgeport, Conn.

The Submarine

L. Y. Spear, M. Soc. N. A. and M. E.,
Groton, Conn.

Present Conditions of the Submarine

Max A. Laubeuf, Paris, France.

Modern Marine Gun Armament

H. F. Leary, Lieut., U. S. N., Washington, D. C.

General Problem of Naval Warfare

D. W. Knox, Lt.-Comdr., U. S. N.,
Washington, D. C.

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Charles F. Bailey, M. Soc. N. A. and
M. E., Newport News, Va.

The Development of the Marine Steam Turbine

H. C. Dinger, Lt.-Comdr., U. S. N.,
Washington, D. C.

The Application of the Steam Turbine to Marine Propulsion

J. F. Metten, M. Soc. N. A. and M. E.,
Philadelphia, Pa.

Recent Development in Marine Engineering in Japan

M. Tsutsumi, Tokyo, Japan.

Fuel Oil

Ernest H. Peabody, M. Am. Soc.
M. E., M. Soc. N. A. and M. E.,
New York, N. Y.

The Diesel Motor Applied to Marine Purposes

C. Kloos, Amsterdam, The Netherlands.

Cargo Handling Methods and Appliances

H. McL. Harding, New York, N. Y.

Cargo Handling Methods and Appliances

James A. Jackson, Assoc. M. Am.
Inst. E. E., Schenectady, N. Y.

Some Economic Fundamentals of Freight Handling

David B. Rushmore, M. Am. Soc.
C. E., M. Am. Inst. E. E., M. Am.
Soc. M. E., M. Am. Inst. M. E.,
Schenectady, N. Y.

The Modern Trend in American Marine Terminals

Robert H. Rogers, Schenectady, N. Y.

American Graving Dock Practice

Leonard M. Cox, Civil Engr., U. S. N.,
M. Am. Soc. C. E., New York, N. Y.

Dry Docks Recently Built in Italy

Luigi Luigi, M. Am. Soc. C. E.,
M. Inst. C. E., Pres., Italian Soc.
C. E., Rome, Italy.

VOLUME XI

Miscellaneous

AERONAUTICS

Arrival of the Aeroplane

A. E. Berriman, M. Inst. A. E., A. F.
Aé. S., Coventry, England.

A Discussion Concerning the Theory of Sustentation and Expenditure of Power in Flight

F. W. Lanchester, M. Inst. C. E., Birmingham, England.

Recent Progress in Aviation in France

L. Marchis, Paris, France.

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Principles and Theories of Aerodynamics

J. C. Hunsaker, Lieut., Naval Constructor, U. S. N., Boston, Mass.

REFRIGERATION

Refrigeration

J. F. Nickerson, M. Am. Assoc. of Refrigeration, Chicago, Ill.

Refrigeration

Thor Andersson, Stockholm, Sweden.

Refrigeration in France

L. Marchis, Paris, France.

AGRICULTURAL ENGINEERING

Agriculture and the Engineer

J. B. Davidson, M. Am. Soc. A. E., M. Am. Soc. M. E., Ames, Iowa.

Some Observations on the Extent and Value of Farm Power Equipment

Philip S. Rose, M. Am. Soc. Agri. Engrs., Madison, Wis.

ENGINEERING EDUCATION

Some Considerations Regarding Engineering Education in America

George F. Swain, Past-Pres. Am. Soc. C. E., M. Am. Soc. M. E., Cambridge, Mass.

Technical Education for the Professions of Applied Science

Ira N. Hollis, M. Am. Soc. M. E., Worcester, Mass.

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HEATING AND VENTILATION

Introductory Paper

R. C. Carpenter, M. Am. Soc. M. E., Ithaca, N. Y.

Recent Developments in Heating and Ventilation Art

D. D. Kimball, Pres. Am. Soc. Heat. and Vent. Engrs., New York, N. Y.

Vacuum, Vacuum and Atmospheric Heating Systems

J. D. Hoffman, M. Am. Soc. M. E., Lincoln, Nebr.

SCIENTIFIC MANAGEMENT

Developments and Progress in "Scientific Management" During Recent Years

E. P. Lesley, M. Am. Soc. M. E., Leland Stanford Jr. University, Cal.

Industrial Management

A. Hamilton Church, New York, N. Y.

Motion Study and Time Study Instruments of Precision

Frank B. Gilbreth, M. Am. Soc. M. E., and Lillian Moller Gilbreth, Providence, R. I.

Symposium on the Status of Engineering in Chile

Contributed through G. Lira, Santiago, Chile.

ANNOUNCEMENTS

The House of the Society is open from 9 A. M. to 10 P. M., every day, except Sundays, Fourth of July, Thanksgiving Day, and Christmas Day.

FUTURE MEETINGS

December 1st, 1915.—8.30 P. M.—This will be a regular business meeting. Two papers will be presented for discussion, as follows: "The Automatic Volumeter", by E. G. Hopson, M. Am. Soc. C. E.; and "The Cherry Street Bridge, Toledo, Ohio", by Clement E. Chase, Jun. Am. Soc. C. E.

These papers were printed in *Proceedings* for October, 1915.

December 15th, 1915.—8.30 P. M.—At this meeting a paper by Benjamin F. Groat, M. Am. Soc. C. E., entitled "Chemi-Hydrometry and Its Application to the Precise Testing of Hydro-Electric Generators", will be presented for discussion.

This paper is printed in this number of *Proceedings*.

January 5th, 1916.—8.30 P. M.—A regular business meeting will be held, and a paper by William P. Creager, M. Am. Soc. C. E., entitled "The Economical Top Width of Non-Overflow Dams", will be presented for discussion.

This paper is printed in this number of *Proceedings*.

ANNUAL MEETING

The Sixty-third Annual Meeting will be held at the Society House, on Wednesday and Thursday, January 19th and 20th, 1916. The Business Meeting will be called to order at 10 o'clock on Wednesday morning. The Annual Reports will be presented, officers for the ensuing year elected, members of the Nominating Committee appointed, Reports of Special Committees presented for discussion, and other business transacted.

SEARCHES IN THE LIBRARY

In January, 1902, the Secretary was authorized to make searches in the Library, upon request, and to charge therefor the actual cost to the Society for the extra work required. Since that time many searches have been made, and bibliographies and other information on special subjects furnished.

The resulting satisfaction, to the members who have made use of the resources of the Society in this manner, has been expressed frequently, and leaves little doubt that if it were generally known to the membership that such work would be undertaken, many would avail themselves of it.

The cost is trifling compared with the value of the time of an engineer who looks up such matters himself, and the work can be per-

formed quite as well, and much more quickly, by persons familiar with the library.

In asking that such work be undertaken, members should specify clearly the subject to be covered, and whether references to general books only are desired, or whether a complete bibliography, involving search through periodical literature, is desired.

In making a search it sometimes happens that references are found which are not readily accessible to the person for whom the search is made. In that case the material may be reproduced by photography, and this can be done for members at the cost of the work to the Society, which is small. This method is particularly useful when there are drawings or figures in the text, which would be very expensive to reproduce by hand.

PAPERS AND DISCUSSIONS

Members and others who take part in the oral discussions of the papers presented are urged to revise their remarks promptly. Written communications from those who cannot attend the meetings should be sent in at the earliest possible date after the issue of a paper in *Proceedings*.

All papers accepted by the Publication Committee are classified by the Committee with respect to their availability for discussion at meetings.

Papers which, from their general nature, appear to be of a character suitable for oral discussion, will be published as heretofore in *Proceedings*, and set down for presentation to a future meeting of the Society, and on these, oral discussions, as well as written communications, will be solicited.

All papers which do not come under this heading, that is to say, those which from their mathematical or technical nature, in the opinion of the Committee, are not adapted to oral discussion, will not be scheduled for presentation to any meeting. Such papers will be published in *Proceedings* in the same manner as those which are to be presented at meetings, but written discussions only will be requested for subsequent publication in *Proceedings* and with the paper in the volumes of *Transactions*.

The Board of Direction has adopted rules for the preparation and presentation of papers, which will be found on page 429 of the August, 1913, *Proceedings*.

LOCAL ASSOCIATIONS OF MEMBERS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS

San Francisco Association

The San Francisco Association of Members of the American Society of Civil Engineers holds regular bi-monthly meetings, with banquet, and weekly informal luncheons. The former are held at

6 p. m., at the Palace Hotel, on the third Friday of February, April, June, August, October, and December, the last being the Annual Meeting of the Association.

Informal luncheons are held at 12.15 p. m., every Wednesday, and the place of meeting may be ascertained by communicating with the Secretary of the Association, E. T. Thurston, Jr., 713 Mechanics' Institute, 57 Post Street.

The by-laws of the Association provide for the extension of hospitality to any member of the Society who may be temporarily in San Francisco, and any such member will be gladly welcomed as a guest.

(Abstract of Minutes of Meeting)

August 20th, 1915.—The meeting was called to order; Vice-President Couchot in the chair; E. T. Thurston, Jr., Secretary; and present, also, 66 members and guests.

On motion, duly seconded, the meeting adopted the recommendation of the Board of Directors that the Association participate in a material way in the entertainment of visiting members of the Society by assuming the responsibility of the reception, dinner, and dance to be given at the Old Faithful Inn, on September 16th, 1915.

Mr. C. E. Grunsky, Chairman of the Committee of Arrangements for the Annual Convention, spoke of alternate excursions to the Del Monte trip provided by the Engineering Congress.

Messrs. C. H. Snyder, Frederick R. Muhs, and William H. Popert, were appointed by the Chair as the Entertainment Committee for the next meeting.

Mr. E. F. Kriegsman addressed the meeting on the advantages to the engineer of proficiency in public speaking, and, on motion, duly seconded, a suggestion that the Association make provision for instructing its members in public speaking, was referred to the Board of Directors.

A paper entitled "Types of Country Roads", by Mr. M. O. Eldridge, was presented by the author, who illustrated his remarks with stereopticon views.

Adjourned.

Colorado Association

The meetings of the Colorado Association of Members of the American Society of Civil Engineers (Denver, Colo.) are held on the second Saturday of each month, except July and August. The hour and place of meeting are not fixed, but this information will be furnished on application to the Secretary, L. R. Hinman, 1400 West Colfax Ave., Denver, Colo. The meetings are usually preceded by an informal dinner. Members of the American Society of Civil Engineers will be welcomed at these meetings.

Weekly luncheons are held on Wednesdays, at 12.30 p. m., at Clarke's Restaurant, 1632 Champa Street.

Visiting members are urged to attend the meetings and luncheons.

Atlanta Association

The Atlanta Association of Members of the American Society of Civil Engineers was organized on March 14th, 1912. The Association holds its meetings at the University Club, Atlanta, Ga.

At the meeting of the Association on January 9th, 1915, the following officers were elected for the ensuing year: President, Park A. Dallis; First Vice-President, B. M. Hall; Second Vice-President, P. H. Norcross; Secretary-Treasurer, T. B. Branch.

Baltimore Association

On May 6th, 1914, the Baltimore Association of Members of the American Society of Civil Engineers was organized, a Constitution adopted, and the following officers were elected: J. E. Greiner, President; Francis Lee Stuart, First Vice-President; L. H. Beach, Second Vice-President; Harry D. Williar, Jr., Secretary-Treasurer; and Messrs. H. D. Bush, B. T. Fendall, B. P. Harrison, Calvin W. Hendrick, Oscar F. Lackey, M. A. Long, and A. A. Thompson, Directors.

At its meeting of September 2d, 1914, the Board of Direction considered and approved the proposed Constitution of the Baltimore Association of Members of the American Society of Civil Engineers.

Cleveland Association

The proposed Constitution of the Cleveland Association of Members of the American Society of Civil Engineers was considered and approved by the Board of Direction of the Society on January 6th, 1915.

The following officers have been elected: President, Willard Beahan; Vice-President, Robert Hoffmann; Secretary-Treasurer, George H. Tinker.

Louisiana Association

At the meeting of the Louisiana Association of Members of the American Society of Civil Engineers (New Orleans, La.), on April 14th, 1915, the following officers were elected for the ensuing year: J. F. Coleman, President; W. B. Gregory and A. M. Shaw, Vice-Presidents; Ole K. Olsen, Treasurer; and E. H. Coleman, Secretary.

Northwestern Association

The proposed Constitution of the Northwestern Association of Members of the American Society of Civil Engineers (St. Paul and Minneapolis, Minn.) was considered and approved by the Board of Direction of the Society on November 4th, 1914. F. W. Cappelen is President and R. D. Thomas, Secretary.

Philadelphia Association

The meetings of the Philadelphia Association of Members of the American Society of Civil Engineers are held at the Engineers' Club of Philadelphia, 1317 Spruce Street.

The officers of the Association are as follows: President, Edward B. Temple; Vice-Presidents, Edgar Marburg and John Sterling Deans; Directors, J. W. Ledoux, H. S. Smith, Henry H. Quimby, and George A. Zinn; Past-Presidents, George S. Webster and Richard L. Humphrey; Treasurer, S. M. Swaab; and Secretary, W. L. Stevenson.

(Abstract of Minutes of Meeting)

October 4th, 1915.—The Annual Meeting was called to order at the Engineers' Club; President Richard L. Humphrey in the chair; W. L. Stevenson, Secretary; and present, also, 50 members.

The Annual Reports of the Secretary and Treasurer were accepted and approved.

A memoir of the late William Hunter, M. Am. Soc. C. E., prepared by a Committee consisting of Messrs. George S. Webster (Chairman), Edward B. Temple, and Samuel T. Wagner, was read and approved.

Dr. John A. Brashear, President of the American Society of Mechanical Engineers, delivered an illustrated address on "Contributions of Photography to Our Knowledge of the Stellar Universe".

A vote of thanks was extended to Dr. Brashear.

The report of the Tellers was presented, showing the unanimous election of the following officers for the ensuing year: President, Edward B. Temple; Vice-President, John Sterling Deans; Directors, Henry H. Quimby and George A. Zinn; and Treasurer, S. M. Swaab.

Mr. Temple was installed as President.

Adjourned.

Portland, Ore., Association

At the Annual Meeting of the Association on September 28th, 1915, the following officers were elected for the ensuing year: President, J. P. Newell; First Vice-President, John T. Whistler; Second Vice-President, E. B. Thomson; Treasurer, Russell Chase; and Secretary, J. A. Currey.

St. Louis Association

The proposed Constitution of the St. Louis Association of Members of the American Society of Civil Engineers was considered and approved by the Board of Direction of the Society on October 7th, 1914.

The following officers have been elected: President, J. A. Ockerson; First Vice-President, Edward E. Wall; Second Vice-President, F. J. Jonah; Secretary-Treasurer, Gurdon G. Black. The meetings of the Association are held at the Engineers' Club Auditorium.

San Diego Association

The San Diego Association of Members of the American Society of Civil Engineers was organized on February 5th, 1915, and officers have been elected, as follows: President, George Butler; Vice-President, Willis J. Dean; and Secretary-Treasurer, J. R. Comly.

At its meeting of September 20th, 1915, the Board of Direction considered and approved the proposed Constitution of the San Diego Association of Members of the American Society of Civil Engineers.

Seattle Association

The Seattle Association of Members of the American Society of Civil Engineers was organized on June 30th, 1913. At its meeting of January 25th, 1915, the following officers were elected for the ensuing year: President, R. H. Ober; Vice-President, A. S. Downey; and Secretary-Treasurer, Carl H. Reeves.

(Abstract of Minutes of Meetings)

September 27th, 1915.—The meeting was called to order at 12.15 P. M.; President R. H. Ober in the chair; Carl H. Reeves, Secretary; and present, also, 33 members and guests.

The minutes of the meeting of August 30th, 1915, were read and approved.

On motion, duly seconded, President Ober appointed Messrs. S. H. Hedges, Ernest B. Hussey, and A. O. Powell, a committee to suggest the name or names of members for the Nominating Committee of the Society from this District.

Messrs. John R. Freeman, Charles F. Loweth, and E. E. Haskell addressed the meeting on the work of the United Engineering Societies and on the need of closer affiliation of all the National engineering societies.

Addresses were also made by Col. J. B. Cavanaugh and Prof. Milnor Roberts, the latter giving a brief outline of the work of the International Engineering Congress, at San Francisco, Cal.

Adjourned.

October 25th, 1915.—The meeting was called to order at 12.15 P. M.; President Ober in the chair; Carl H. Reeves, Secretary; and present, also, 17 members and guests.

The minutes of the meeting of September 27th, 1915, were read and approved.

In accordance with the Resolution passed at the meeting of August 30th, 1915, the President appointed Messrs. Robert Howes and John L. Hall, as members of the Conference Committee, to act for the Association in connection with the signing of the Articles of Agreement for the affiliation of the local engineering societies.

A letter from the Secretary of the Puget Sound Section of the American Chemical Society announcing its adoption, with minor changes, of the Articles of Agreement was read, and Secretary Reeves announced that similar action had been taken by the Local Section of the American Institute of Electrical Engineers.

W. Edward Wilson, ex-Chief Engineer of the International Waterways Commission, addressed the meeting briefly on the work of that Commission.

Mr. T. H. Carver was admitted to membership in the Association.

Mr. S. H. Hedges suggested that other local associations be notified of the Annual Meeting and banquet of the Association.

Messrs. A. M. Sargent and A. H. Dimock addressed the meeting briefly on the Lake Washington Canal Locks and on the status of the City bridges over the Lake Washington Canal.

Mr. Hedges reported progress on the matter of re-districting the membership of the Society.

Adjourned.

Southern California Association

The Southern California Association of Members of the American Society of Civil Engineers (Los Angeles, Cal.) holds regular bi-monthly meetings, with banquet, on the second Wednesday of Feb-

ruary, April, June, August, October, and December, the last being the Annual Meeting of the Association.

Informal luncheons are held at 12.15 p. m. every Wednesday, and the place of meeting may be ascertained from the Secretary of the Association, W. K. Barnard, 514 Central Building, Los Angeles, Cal.

The by-laws of the Association provide for the extension of hospitality to any member of the Society who may be temporarily in Los Angeles, and any such member will be gladly welcomed as a guest at any of the meetings or luncheons.

Spokane Association

The proposed Constitution of the Spokane Association of Members of the American Society of Civil Engineers was considered and approved by the Board of Direction of the Society on March 4th, 1914. Ulysses B. Hough is President.

Texas Association

The proposed Constitution of the Texas Association of Members of the American Society of Civil Engineers was considered and approved by the Board of Direction of the Society on December 31st, 1913. The headquarters of the Association is Dallas, Tex. John B. Hawley is President.

MINUTES OF MEETINGS OF SPECIAL COMMITTEES TO REPORT UPON ENGINEERING SUBJECTS

Special Committee on Floods and Flood Prevention

August 30th, 31st, and September 1st, 1915.—The meetings were held in St. Louis, Mo., at the office of the President of the Mississippi River Commission. Present, C. McD. Townsend (Chairman), Daniel W. Mead, John A. Ockerson, and F. L. Sellew.

Letters from other members of the Committee were read and considered, and a report was prepared to be submitted to the next regular meeting of the Society.

Special Committee on Valuation of Public Utilities

October 11th, 12th, 13th, and 14th, 1915.—Ten meetings were held at the Society House. Present, F. P. Stearns (Chairman), H. E. Riggs, W. G. Raymond, C. S. Churchill, and J. P. Snow.

Eight of the ten meetings were devoted largely to a discussion of the subject of Depreciation and the other two to Cost of Reproduction.

It was decided that the next meeting of the Committee should be held during the latter part of December, 1915.

Special Committee on Materials for Road Construction

October 23d, 1915.—The meeting was held at the House of the Society. Present, W. W. Crosby (Chairman), Nelson P. Lewis, Charles J. Tilden, and A. H. Blanchard (Secretary).

The minutes of the meeting of August 13th, 1915, were read and approved.

The tentative draft of the 1915 Report, containing conclusions proposed by the sub-committees on the several non-bituminous road materials, was presented by the Chairman.

The sections of the Report covering general conclusions pertaining to non-bituminous road materials and specific conclusions relative to broken stone and slag roadways, gravel roadways, cement-concrete pavements, and brick and slag block pavements, were tentatively adopted.

It was decided that the next meeting of the Committee should be held at the House of the Society on November 4th, 1915.

**PRIVILEGES OF ENGINEERING SOCIETIES
EXTENDED TO MEMBERS OF THE
AMERICAN SOCIETY OF CIVIL ENGINEERS**

Members of the American Society of Civil Engineers will be welcomed by the following Engineering Societies, both to the use of their Reading Rooms, and at all meetings:

American Institute of Mining Engineers, 29 West Thirty-ninth Street, New York City.

American Society of Mechanical Engineers, 29 West Thirty-ninth Street, New York City.

Architekten-Verein zu Berlin, Wilhelmstrasse 92, Berlin W. 66, Germany.

Associação dos Engenheiros Civis Portuguezes, Lisbon, Portugal.

Australasian Institute of Mining Engineers, Melbourne, Victoria, Australia.

Boston Society of Civil Engineers, 715 Tremont Temple, Boston, Mass.

Brooklyn Engineers' Club, 117 Remsen Street, Brooklyn, N. Y.

Canadian Society of Civil Engineers, 176 Mansfield Street, Montreal, Que., Canada.

Civil Engineers' Society of St. Paul, St. Paul, Minn.

Cleveland Engineering Society, Chamber of Commerce Building, Cleveland, Ohio.

Cleveland Institute of Engineers, Middlesbrough, England.

Dansk Ingeniorforening, Amaliegade 38, Copenhagen, Denmark.

Detroit Engineering Society, 46 Grand River Avenue, West Detroit, Mich.

Engineers and Architects Club of Louisville, 1412 Starks Building, Louisville, Ky.

Engineers' Club of Baltimore, 6 West Eager Street, Baltimore, Md.

Engineers' Club of Kansas City, E. B. Murray, Secretary, 920 Walnut Street, Kansas City, Mo.

- Engineers' Club of Minneapolis**, 17 South Sixth Street, Minneapolis, Minn.
- Engineers' Club of Philadelphia**, 1317 Spruce Street, Philadelphia, Pa.
- Engineers' Club of St. Louis**, 3817 Olive Street, St. Louis, Mo.
- Engineers' Club of Toronto**, 96 King Street, West, Toronto, Ont., Canada.
- Engineers' Club of Trenton**, Trent Theatre Building, 12 North Warren Street, Trenton, N. J.
- Engineers' Society of Northeastern Pennsylvania**, 415 Washington Avenue, Scranton, Pa.
- Engineers' Society of Pennsylvania**, 31 South Front Street, Harrisburg, Pa.
- Engineers' Society of Western Pennsylvania**, 2511 Oliver Building, Pittsburgh, Pa.
- Institute of Marine Engineers**, The Minories, Tower Hill, London, E., England.
- Institution of Engineers of the River Plate**, Calle 25 de Mayo 195, Buenos Aires, Argentine Republic.
- Institution of Naval Architects**, 5 Adelphi Terrace, London, W. C., England.
- Junior Institution of Engineers**, 39 Victoria Street, Westminster, S. W., London, England.
- Koninklijk Instituut van Ingenieurs**, The Hague, The Netherlands.
- Louisiana Engineering Society**, State Museum Building, Chartres and St. Ann Streets, New Orleans, La.
- Memphis Engineers' Club**, Memphis, Tenn.
- Midland Institute of Mining, Civil and Mechanical Engineers**, Sheffield, England.
- Montana Society of Engineers**, Butte, Mont.
- North of England Institute of Mining and Mechanical Engineers**, Newcastle-upon-Tyne, England.
- Oesterreichischer Ingenieur- und Architekten-Verein**, Eschenbachgasse 9, Vienna, Austria.
- Oregon Society of Civil Engineers**, Portland, Ore.
- Pacific Northwest Society of Engineers**, 312 Central Building, Seattle, Wash.
- Rochester Engineering Society**, Rochester, N. Y.
- Sachsenischer Ingenieur- und Architekten-Verein**, Dresden, Germany.
- Sociedad Colombiana de Ingenieros**, Bogota, Colombia.
- Sociedad de Ingenieros del Peru**, Lima, Peru.

- Societe des Ingenieurs Civils de France**, 19 rue Blanche, Paris, France.
- Society of Engineers**, 17 Victoria Street, Westminster, S. W., London, England.
- Svenska Teknologforeningen**, Brunkebergstorg 18, Stockholm, Sweden.
- Tekniske Forening**, Vestre Boulevard 18-1, Copenhagen, Denmark.
- Western Society of Engineers**, 1737 Monadnock Block, Chicago, Ill.

ACCESSIONS TO THE LIBRARY

(From October 4th to November 1st, 1915)

DONATIONS*

EXAMPLES IN ALTERNATING-CURRENTS, VOL. I.

For Students and Engineers. By F. E. Austin. Leather, $7\frac{1}{2}$ x 5 in., illus., 223 pp. Hanover, N. H., The Author, 1915. \$2.40.

One of the objects of this book, as stated in the preface, is to assist college students, as well as those pursuing correspondence courses, in Electrical Engineering, to apply fundamental principles in engineering practice by the solution of engineering problems. It is also intended, it is said, to supply the guidance needed by such students in their work and to lessen the labor of the teacher. The subject-matter is composed of definitions and examples as applied to the subject of alternating currents, together with problems and their solution. The author calls attention to various tabulated values contained herein, which, he states, save time in solving problems in class-work and in practice. Although the book is intended for students, the results obtained in the solution of many of the problems can be applied, it is said, to considerable advantage by mechanical, civil, or electrical engineers in ordinary practice. A partial list of Contents is: Notation; The Greek Alphabet; The Pythagorean Theorem; Trigonometrical Functions of the Sum and Difference of Two Angles; Tabulation of Trigonometrical Functions; Relations of Trigonometrical Functions of Double and Half Angles; Expressions Involving the Powers of Trigonometrical Functions; Relations of Trigonometrical Functions of Three or More Angles; Some Trigonometrical Relations; Resultant of Two Forces; Solution of Triangles; Rules for Determining the Elementary Functions Involving a Single Variable; Integration; Definitions; Frequency; Production of Electro-Motive Force; Average Value of Sine-Curve; Rate of Change of Sine-Curve Alternating-Quantities; How to Plot the "Curve of Squares" for a Circle; Methods of Finding the Areas of Curves; Effective or R. M. S. Values of Non-Sine Pressures; Instantaneous Values of Non-Sine Pressures and Currents; Resultant of Four Pressures; Addition of Sine-Pressures; Non-Sine Alternating Curves; etc., etc.

HOW TO MAKE LOW-PRESSURE TRANSFORMERS.

By F. E. Austin. Second Edition with Additions. Cloth, $7\frac{1}{2}$ x 4 $\frac{1}{2}$ in., illus., 17 pp. Hanover, N. H., The Author, 1915. 40 cents.

The Introduction states that, in answer to many inquiries regarding the design, construction, and operation of small transformers for experimental purposes, the author has given, in this book, working directions and data for making such transformers, from 100 to 400 watts, at small cost and without the use of expensive tools and machinery. In order to illustrate his theories clearly, he has described briefly and concisely the building of a "step-down" transformer, to reduce the pressure from 110 volts to about 8 volts as a minimum, which may be used in operating low-pressure tungsten lamps, motors, electric bells, sparking devices for gasoline engines, small arc-lights, etc. In this, the second, edition, much additional matter has been included, it is said, in answer to a number of questions pertaining to fundamental principles received by the author, from those interested in transformer construction, after the issue of the first edition.

DIRECTIONS FOR DESIGNING, MAKING, AND OPERATING HIGH-PRESSURE TRANSFORMERS.

By F. E. Austin. Cloth, 8 x 5 in., illus., 46 pp. Hanover, N. H., The Author, 1914. 65 cents.

This book is a companion volume to the author's "How to Make a Transformer for Low-Pressures", and has been written, it is stated, for the engineering student and for all those who build or operate high-pressure transformers. After a brief discussion of the types of transformers in use, which includes data on losses in a transformer, power factors, etc., the author outlines briefly the design and construction of a 20 000-volt transformer and includes data which may be applied in building high-pressure transformers for various experimental uses, such as wireless telegraphy, for the production of "ozone", vacuum tube lighting, etc. In this description the author has given all the necessary calculations and materials, as well as the approximate cost of the materials used. The mathematical treatment is simple and the subject-matter is fully illustrated. It is hoped that the book will serve as an aid to the student in grasping the general principles of transformer design and operation.

* Unless otherwise specified, books in this list have been donated by the publishers.

RIVINGTON'S NOTES ON BUILDING CONSTRUCTION:

A Book of Reference for Architects and Builders and a Text-Book for Students, Parts I-II. Edited by W. Noble Twelvetrees. New Edition, Entirely Rewritten. Cloth, 9 x 6 in., illus., 2 vol. London, New York, Longmans, Green and Co., 1915.

The preface states that the first edition of this work was published in 1875, and was intended primarily to assist students preparing for the examinations in Building Construction held under the direction of the Board of Education, South Kensington, London, England. In order, at this time, to bring the subject-matter up to date and to maintain its reputation as a standard text-book for students on the design, construction, and equipment of buildings and as a reference book for architects and builders, the book, it is stated, has been entirely re-written by well-known architects and others having special knowledge of the subjects, many new chapters having been added, together with numerous illustrations. The subject-matter is divided into two parts, Part I dealing, it is said, with matters preliminary to building operations and with various forms of construction by which buildings of different types can be constructed from foundation to roof level, and Part II with classes of work which relate to the finishing of buildings for occupation and with various kinds of sanitary and engineering equipment. Part II, it is stated, may also be found useful as an independent manual for plumbers and sanitary engineers. The Appendix contains selected Examination Questions from papers set by the Royal Institute of British Architects, the Board of Education, the City and Guilds of London Institute, etc., etc. There is also a List of Contributors whose names indicate, it is said, the authoritative sources of the work. The Contents are: Part I: Building Regulations; Sites and Foundations; Timbering Excavations, Shoring and Underpinning; Scaffolding; Centers and Moulds; Brickwork; Masonry; Walls, Piers, and Retaining Walls; Arches, Vaulting, and Domes; Chimneys, and Setting for Stoves, Ranges, and Boilers; Damp and Sound-Resisting Construction; Iron and Steel Work; Steel Skeleton Buildings; Reinforced Concrete, etc.; Fire-Resistant Construction; Carpentry; Partitions; Appendix; Index. Part II: Roofs and Roofing; Timber Roof; Steel Roofs; Roof Coverings; Structural Plumbing; Joinery; Windows and Glazing; Stairs and Staircases; Plastering; Painting and Decorating; Drainage and Sewage Disposal; Water Supply, Plumbing, and Sanitation; Sanitary Fittings; Heating, Ventilation, and Hot-Water Supply; Gas and Electric Lighting; Gas-Fitting and Electric-Light Installation; Electric Bells, Telephones, and Lightning Conductors; Fire Equipment; Appendix; Index.

MECHANICAL DRAWING FOR SCHOOLS AND UNIVERSITIES.

By James D. Phillips and Herbert D. Orth. Cloth, 9 x 6 in., illus., 283 pp. Chicago, New York, Scott, Foresman and Company, 1915.

Drawings are stated by the authors to be to-day one of the first steps in the production of practically all machines and structures, and, in this book, it has been their aim to arrange a course in drawing which will give the student some idea of the best commercial drafting practice in that subject. The course, as presented in this book, is the result of years of experience and test in teaching the subject and is stated to be a course in working drawings supplemented by lectures and problems for the college student without previous training in the subject. The material is presented, it is stated, in the order in which it would occur in a commercial drafting-room, and is arranged to distribute the theory and the use of the instruments so that the student will comprehend both. Attention is called to the subject of Perspective Sketching as treated in the first chapter. Each problem included has been chosen, it is said, to illustrate principles of representation, dimensions, etc., and with each orthographic problem a type problem is given, which consists of given data and the solution of a problem similar to that assigned to the student. Chapter X, Instructor's Guide, is intended, it is stated, to aid the instructor in securing the viewpoint of the author and to reinforce his individual method. The Chapter Headings are: Perspective Sketching; Orthographic Sketching; Pencil Mechanical Drawing; Tracing and Blueprinting; Instruments and Materials; Conventions; Lettering; Advanced Drawing; Auxiliary Views, Isometric and Cabinet Drawing, Tables, etc.; Instructor's Guide; Outline of Course in Mechanical Drawing; Index.

PRACTICAL SURVEYING:

For Surveyors' Assistants, Vocational, and High Schools. By Ernest McCullough, M. Am. Soc. C. E. Cloth, 7½ x 5 in., illus., 9 + 401 pp. New York, D. Van Nostrand Company, 1915. \$2.00.

This book, the author states, is a serious attempt on his part to meet the needs of students in surveying, whose mathematical preparation does not extend beyond the arithmetic taught in grade schools, and it is intended, therefore, as a textbook for

high schools, vocational schools, and evening classes, and as an aid to self-tutored men who wish to become surveyors. The subject, it is stated, has been presented in a logical manner, the various methods of surveying being described, in popular style, together with the instruments used and their care, and, at the end of each chapter, are given problems relating to the matter discussed in that chapter. The mathematical instruction is given step by step as needed, it is stated, and there is a chapter on trigonometry which, it is said, contains the minimum knowledge of that subject which a surveyor should possess. The Appendix on the essentials of algebra should serve, it is stated, as a useful introduction to the study of algebra. The methods of land surveying have been emphasized, but sufficient engineering surveying has been included, it is said, to help local surveyors over hard places. There is a chapter on surveying law and practice which, the author states, should be of much use to the student and about which he seldom knows anything until he begins practical work. The names and prices of books dealing more fully with the subject discussed will be found in many places in the text. The Contents are: Introductory; Chain Surveying; Leveling; Compass Surveying; Trigonometry; Transit Surveying; Surveying Law and Practice; Engineering Surveying; Appendix A: The Essentials of Algebra.

THOMAS' REGISTER OF AMERICAN MANUFACTURERS

And First Hands in All Lines, October, 1915. Seventh Edition. Cloth, $12\frac{1}{2} \times 10\frac{1}{4}$ in., illus., 3 100 pp. New York, Thomas Publishing Company, 1915. \$15.00.

In a secondary title, it is stated that this work is the largest classified reference book in the world and the only one in the United States covering all lines for the use of Federal, State, and City Government Departments, American and foreign consuls, exporters, merchants' and manufacturers' associations, boards of trade, libraries, banks, railroads, contractors, merchants, manufacturers, and buyers and sellers in all lines. The main portion of the text contains a list of manufacturers, arranged alphabetically by subject, State, city, and name and address of firm. There is also an index to American manufacturers, arranged alphabetically by name, which gives the home and branch offices, names of individual officers, etc., of all manufacturers having a capital investment of \$50 000 or more, or a widely distributed business. A buyers' quick reference list of leading trade names, arranged alphabetically, is included, as well as an Appendix containing the names of architects, representative banks, and commercial organizations, all arranged alphabetically by State, city, and firm, and a list of trade publications arranged by subject. The Contents are: Section I, Finding List and Index; Section II, Lists of Manufacturers Classified According to Business; Section III, Manufacturers of the United States, Arranged Alphabetically by Name, Giving Home Offices, Branch Offices, Names of Officers, Sales Managers, Purchasing Agents, etc.; Section IV, Leading Trade Names, Brands, etc.; Section V, Appendix: Architects, Machinists, and Founders, Banks, Boards of Trade and Other Commercial Organizations, Leading Trade Papers, etc.

THE ELASTICITY AND RESISTANCE OF THE MATERIALS OF ENGINEERING.

By William H. Burr, M. Am. Soc. C. E. Seventh Edition, Thoroughly Revised. Cloth, $9\frac{1}{2} \times 6\frac{1}{2}$ in., 19 + 928 pp. New York, John Wiley & Sons, Inc.; London, Chapman & Hall, Limited, 1915. \$5.50.

The rapid development which has characterized all branches of engineering construction during the past decade carries with it, the author states, corresponding advances in experimental and analytical work in that field of engineering comprised in this book. In this new edition, prepared to meet the advancing requirements of the Profession, much of the older and obsolete material has been omitted, and many new topics have been added, the new subject-matter comprising, it is said, about three-fourths of the book. Among other new parts, the treatment of reinforced concrete, the general analysis of which as a development of the common theory of flexure was first given in a previous edition, has been extended, it is said, to cover practically all the principal features of that field. The analysis given is general, but simple and free, it is stated, from the modern complicated formulas, and the results of the most recent experimental investigations have been used for the requisite empirical data, in order, the author states, to make the book a real work on the Elasticity and Resistance of the Materials of Engineering, rather than a mere matter of Applied Mechanics. The Contents are: Part I, Analytical: Elementary Theory of Elasticity in Amorphous Solid Bodies; Flexure; Torsion; Hollow Cylinders and Spheres; Resilience; Combined Stress Conditions. Part II, Technical: Tension; Compression; Riveted Joints and Pin Connection; Long Columns; Shearing and Torsion; Bending or Flexure; Concrete-Steel Members; Rolled and Cast-Flanged Beams; Plate Girders; Miscellaneous Subjects; The Fatigue of Metals; The Flow of Solids. Appendix I, Elements of Theory of Elasticity in Amorphous Solid Bodies; General Equations; Thick Hollow Cylinders, and Spheres, and Torsion; Theory of Flexure. Appendix II, Clavarino's Formula. Appendix III, Resisting Capacity of Natural and Artificial Ice; Index.

FIELD ENGINEERING:

A Handbook of the Theory and Practice of Railway Surveying, Location and Construction. By William H. Searles, M. Am. Soc. C. E. Seventeenth Edition, Revised and Enlarged, by William H. Searles and Howard Chapin Ives, Assoc. M. Am. Soc. C. E. Volume I, Text, Volume II, Tables. Morocco, $6\frac{1}{2}$ x $4\frac{1}{2}$ in., illus., 2 v. in 1. New York, John Wiley & Sons, Inc.; London, Chapman & Hall, Limited, 1915. \$3.00.

The first edition of this book was issued in 1880. In this, the 1915, edition, the text has been entirely re-set, owing to the numerous changes found to be necessary to keep it up to date, resulting in the addition of about 150 pages of new matter and 16 new tables, the re-arrangement of certain portions, and the abridgment of others. The author's aim, as stated in the preface to the first edition, has been to present, in a progressive and logical manner, a complete handbook of railway engineering for field use, together with the problems, formulas, and tables best adapted to the needs of the field engineer and the engineering student. The Contents are: Vol. I, Text: Reconnaissance; Preliminary Survey; Theory of Maximum Economy in Grades and Curves; Location; Simple Curves; Compound Curves; Reversed Curves; Turnouts and Crossings; The Spiral Curve; Leveling; Cross-Sections; Calculation of Earthwork; Earthwork Tables; Earthwork Diagrams; Haul and Mass Diagram; Construction; Track Laying; Topographical Sketching; Adjustment of Instruments. Vol. II, Tables.

HANDBOOK OF CHEMISTRY AND PHYSICS:

A Ready-Reference Pocket Book of Chemical and Physical Data, Compiled from the Most Recent Authoritative Sources. Cloth, $6\frac{1}{2}$ x $4\frac{1}{2}$ in., 322 pp. Cleveland, Ohio, The Chemical Rubber Company, 1914. \$2.00.

The aim of the publishers in issuing this book in its new and revised form, as stated in the preface, has been to present, in one compact volume, a comprehensive reference book on chemical and physical topics, for use in the laboratory and classroom. The material included in these pages is said to have been carefully selected from various standard sources, in accordance with the suggestions received from more than 1,000 members of high standing in the Chemical and Physical Profession. A complete bibliography of textbooks, manuals, reference books, and periodicals of interest to chemists and physicists is also included. The Chapter headings are: Antidotes for Poisons; General Chemical Tables; Properties of Matter; Heat; Hygroscopic and Barometric Tables; Sound; Electricity and Magnetism; Light; Miscellaneous Tables; Definitions and Formulas; Laboratory Arts and Recipes; Measures and Units; Wire Tables; Mathematical Tables; Apparatus Lists; Bibliography; Problems; Index.

SIMPLIFIED REINFORCED CONCRETE MATHEMATICS:

Derivation of Simple Universal Formulas and Application of Same to Beams, Columns, and Arches, with Nomographic Computing Device. By Melvin D. Casler, Assoc. M. Am. Soc. C. E. Cloth, $7\frac{1}{2}$ x 5 in., illus., 6 + 66 pp. New York, D. Van Nostrand Company, 1915. \$1.25.

The main purpose of this book, it is stated, is to provide the engineer with practical working formulas for the design and investigation of reinforced concrete members, and with means for applying these formulas with a minimum of computation. The proposed formulas, it is said, are derived for general application to beams subject to direct longitudinal stress in conjunction with transverse moment, to eccentrically loaded columns, and to arches. One of the objects of the book, as stated by the author, is to simplify the formulas and their application to beams, columns and arches, without loss in mathematical accuracy, so as to make the use of special curves and tables for various assumptions to properties, stresses, dimensions, etc., etc. The author has also included some labor-saving devices for use in proportioning members and has demonstrated, by definite examples, the application of the formulas to beams, columns, and arches. For work of varied nature, the methods given in the book are said to effect a large saving in time over prevalent methods of computation. The Contents are: Derivation of Formulas; Labor-Saving Devices; Illustrative Examples; General Notes on Reinforced Concrete Design.

Gifts have also been received from the following:

- Alabama-State Board of Health. 2 pam.
 Am. Assoc. for the Advancement of
 Science. 1 vol.
 Am. Ry. Assoc. 2 pam.
 Am. Telephone & Telegraph Co. 1 vol.
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Reinforced Concrete in Practice: A Textbook for Those Engaged Upon Structural Works. By A. Alban H. Scott. New York and London, 1915.

American Society for Testing Materials Affiliated with the International Association for Testing Materials: Year Book, 1915, Containing the Standards and Tentative Standards. Edited by the Secretary-Treasurer. Philadelphia, 1915.

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- PARSONS, MAURICE GIESY. Special Engr. in Sale, Harney Co., 711 Corbett Bldg., Portland, Ore.
- PAYNE, LOUIS WATTERS. 3605 Fourteenth St., N. W., Washington, D. C.
- PRENTICE, EDWARD HARPER. 38 Lowell Rd., Schenectady, N. Y.
- SADLER, WALTER CLIFFORD. 106 St. James Ave., Boston, Mass.
- SHEPPARD, NORMAN KIRKWOOD. New Eng. Bldg., Ann Arbor, Mich.
- STEPHENSON, GRANT THOMAS. Gen. Supt., Mashek Chemical & Iron Co., 1308 First National Bank Bldg., Milwaukee, Wis.
- STEVENSON, ERVIN BEECHER. Deputy City Engr., 378 Western Ave., Albany, N. Y.
- THORNTON, CHARLES EDWARD. Care, William M. Thornton, University, Va.
- WILDER, ELLWOOD COGGESHALL. Asst. City and County Engr., 1718 Anapuni St., Honolulu, Hawaii.
- WINN, HARRY STRONG. Asst. Field Engr., Interstate Commerce Comm., Interstate Bldg., Kansas City, Mo.
- WINSOR, HARRY DRAPER. Junior Engr., Public Service Comm., First Dist., 374 Livermore Ave., Westerleigh, N. Y.

RESIGNATIONS

ASSOCIATE MEMBERS

Date of Resignation.

HERRING, JEROME CAMPBELL.....	Sept. 20, 1915
TAYLOR, OLIVER KIRK, JR.....	Sept. 20, 1915

DEATHS

- BERQUIST, AXEL SAMUEL FREDERICK. Elected Member, June 6th, 1906; died October 6th, 1915.
- BOWEN, WALTER COX. Elected Junior, December 31st, 1913; died May 8th, 1915.
- COIT, EDWARD WOOLSEY. Elected Fellow, September 20th, 1872; died September 25th, 1915.
- COLE, OSMAN FRED. Elected Associate Member, September 2d, 1908; died September 27th, 1915.
- DU BOIS, AUGUSTUS JAY. Elected Junior, July 7th, 1875; Member, October 5th, 1892; died October 19th, 1915.

GRAY, EDWARD. Elected Associate Member, May 1st, 1907; Member, December 6th, 1910; died October 2d, 1915.

HARTRICK, EDWARD MACAULAY. Elected Member, February 1st, 1899; died August, 1915.

HOVENDEN, THOMAS. Elected Associate Member, July 9th, 1912; died September 19th, 1915.

KING, WILLIAM BYRD. Elected Member, October 7th, 1896; died October 11th, 1915.

PIHL, OLAF RIDLEY. Elected Member, October 2d, 1899; died October 14th, 1915.

Total Membership of the Society, November 4th, 1915,

7 886.

MONTHLY LIST OF RECENT ENGINEERING ARTICLES OF INTEREST

(October 4th to November 1st, 1915)

NOTE.—*This list is published for the purpose of placing before the members of this Society, the titles of current engineering articles, which can be referred to in any available engineering library, or can be procured by addressing the publication directly, the address and price being given wherever possible.*

LIST OF PUBLICATIONS

In the subjoined list of articles, references are given by the number prefixed to each journal in this list:

- (1) *Journal, Assoc. Eng. Soc., St. Louis, Mo.*, 30c.
- (2) *Proceedings, Engrs. Club of Phila., Philadelphia, Pa.*
- (3) *Journal, Franklin Inst., Philadelphia, Pa.*, 50c.
- (4) *Journal, Western Soc. of Engrs., Chicago, Ill.*, 50c.
- (5) *Transactions, Can. Soc. C. E., Montreal, Que., Canada.*
- (6) *School of Mines Quarterly, Columbia Univ., New York City, 50c.*
- (7) *Gesundheits Ingenieur, München, Germany.*
- (8) *Stevens Institute Indicator, Hoboken, N. J.*, 50c.
- (9) *Engineering Magazine, New York City, 25c.*
- (11) *Engineering (London), W. H. Wiley, 432 Fourth Ave., New York City, 25c.*
- (12) *The Engineer (London), International News Co., New York City, 35c.*
- (13) *Engineering News, New York City, 15c.*
- (14) *Engineering Record, New York City, 10c.*
- (15) *Railway Age Gazette, New York City, 15c.*
- (16) *Engineering and Mining Journal, New York City, 15c.*
- (17) *Electric Railway Journal, New York City, 10c.*
- (18) *Railway Review, Chicago, Ill.*, 15c.
- (19) *Scientific American Supplement, New York City, 10c.*
- (20) *Iron Age, New York City, 20c.*
- (21) *Railway Engineer, London, England, 1s. 2d.*
- (22) *Iron and Coal Trades Review, London, England, 6d.*
- (23) *Railway Gazette, London, England, 6d.*
- (24) *American Gas Light Journal, New York City, 10c.*
- (25) *Railway Age Gazette, Mechanical Edition, New York City, 20c.*
- (26) *Electrical Review, London, England, 4d.*
- (27) *Electrical World, New York City, 10c.*
- (28) *Journal, New England Water-Works Assoc., Boston, Mass.*, \$1.
- (29) *Journal, Royal Society of Arts, London, England, 6d.*
- (30) *Annales des Travaux Publics de Belgique, Brussels, Belgium, 4 fr.*
- (31) *Annales de l'Assoc. des Ing. Sortis des Ecoles Spéciales de Gand, Brussels, Belgium, 4 fr.*
- (32) *Mémoires et Compte Rendu des Travaux, Soc. Ing. Civ. de France, Paris, France.*
- (33) *Le Génie Civil, Paris, France, 1 fr.*
- (34) *Portefeuille Économiques des Machines, Paris, France.*
- (35) *Nouvelles Annales de la Construction, Paris, France.*
- (36) *Cornell Civil Engineer, Ithaca, N. Y.*
- (37) *Revue de Mécanique, Paris, France.*
- (38) *Revue Générale des Chemins de Fer et des Tramways, Paris, France.*
- (39) *Technisches Gemeindeblatt, Berlin, Germany, 0, 70m.*
- (40) *Zentralblatt der Bauverwaltung, Berlin, Germany, 60 pf.*
- (41) *Electrotechnische Zeitschrift, Berlin, Germany.*
- (42) *Proceedings, Am. Inst. Elec. Engrs., New York City, \$1.*
- (43) *Annales des Ponts et Chaussées, Paris, France.*
- (44) *Journal, Military Service Institution, Governors Island, New York Harbor, 50c.*
- (45) *Colliery Engineer, Scranton, Pa.*, 25c.
- (46) *Scientific American, New York City, 15c.*
- (47) *Mechanical Engineer, Manchester, England, 3d.*
- (48) *Zeitschrift, Verein Deutscher Ingenieure, Berlin, Germany, 1, 60m.*
- (49) *Zeitschrift für Bauwesen, Berlin, Germany.*
- (50) *Stahl und Eisen, Düsseldorf, Germany.*
- (51) *Deutsche Bauzeitung, Berlin, Germany.*
- (52) *Riga sche Industrie-Zeitung, Riga, Russia, 25 kop.*
- (53) *Zeitschrift, Oesterreichischer Ingenieur und Architekten Verein, Vienna, Austria, 70h.*
- (54) *Transactions, Am. Soc. C. E., New York City, \$12.*
- (55) *Transactions, Am. Soc. M. E., New York City, \$10.*
- (56) *Transactions, Am. Inst. Min. Engrs., New York City, \$6.*

- (57) *Colliery Guardian*, London, England, 5d.
 (58) *Proceedings*, Engrs. Soc. W. Pa., 2511 Oliver Bldg., Pittsburgh, Pa., 50c.
 (59) *Proceedings*, American Water-Works Assoc., Troy, N. Y.
 (60) *Municipal Engineering*, Indianapolis, Ind., 25c.
 (61) *Proceedings*, Western Railway Club, 225 Dearborn St., Chicago, Ill., 25c.
 (62) *Steel and Iron*, Thaw Bldg., Pittsburgh, Pa., 10c.
 (63) *Minutes of Proceedings*, Inst. C. E., London, England.
 (64) *Power*, New York City, 5c.
 (65) *Official Proceedings*, New York Railroad Club, Brooklyn, N. Y., 15c.
 (66) *Journal of Gas Lighting*, London, England, 6d.
 (67) *Cement and Engineering News*, Chicago, Ill., 25c.
 (68) *Mining Journal*, London, England, 6d.
 (69) *Der Eisenbau*, Leipzig, Germany.
 (71) *Journal, Iron and Steel Inst.*, London, England.
 (71a) *Carnegie Scholarship Memoirs*, Iron and Steel Inst., London, England.
 (72) *American Machinist*, New York City, 15c.
 (73) *Electrician*, London, England, 18c.
 (74) *Transactions*, Inst. of Min. and Metal., London, England.
 (75) *Proceedings*, Inst. of Mech. Engrs., London, England.
 (76) *Brick*, Chicago, Ill., 20c.
 (77) *Journal, Inst. Elec. Engrs.*, London, England, 5s.
 (78) *Beton und Eisen*, Vienna, Austria, 1, 50m.
 (79) *Forscherarbeiten*, Vienna, Austria.
 (80) *Tonindustrie Zeitung*, Berlin, Germany.
 (81) *Zeitschrift für Architektur und Ingenieurwesen*, Wiesbaden, Germany.
 (82) *Mining and Engineering World*, Chicago, Ill., 10c.
 (83) *Gas Age*, New York City, 15c.
 (84) *Le Ciment*, Paris, France.
 (85) *Proceedings*, Am. Ry. Eng. Assoc., Chicago, Ill.
 (86) *Engineering-Contracting*, Chicago, Ill., 10c.
 (87) *Railway Engineering and Maintenance of Way*, Chicago, Ill., 10c.
 (88) *Bulletin of the International Ry. Congress Assoc.*, Brussels, Belgium.
 (89) *Proceedings*, Am. Soc. for Testing Materials, Philadelphia, Pa., \$5.
 (90) *Transactions*, Inst. of Naval Archts., London, England.
 (91) *Transactions*, Soc. Naval Archts. and Marine Engrs., New York City.
 (92) *Bulletin*, Soc. d'Encouragement pour l'Industrie Nationale, Paris, France.
 (93) *Revue de Métallurgie*, Paris, France, 4 fr. 50.
 (95) *International Marine Engineering*, New York City, 20c.
 (96) *Canadian Engineer*, Toronto, Ont., Canada, 10c.
 (98) *Journal, Engrs. Soc. Pa.*, Harrisburg, Pa., 30c.
 (99) *Proceedings*, Am. Soc. of Municipal Improvements, New York City, \$2.
 (100) *Professional Memoirs*, Corps of Engrs., U. S. A., Washington, D. C., 50c.
 (101) *Metal Worker*, New York City, 10c.
 (102) *Organ für die Fortschritte des Eisenbahnwesens*, Wiesbaden, Germany.
 (103) *Mining and Scientific Press*, San Francisco, Cal., 10c.
 (104) *The Surveyor and Municipal and County Engineer*, London, England, 6d.
 (105) *Metallurgical and Chemical Engineering*, New York City, 25c.
 (106) *Transactions*, Inst. of Min. Engrs., London, England, 6s.
 (107) *Schweizerische Bauzeitung*, Zürich, Switzerland.
 (108) *Iron Tradesman*, Atlanta, Ga., 10c.
 (109) *Journal*, Boston Soc. C. E., Boston, Mass., 50c.
 (110) *Journal*, Am. Concrete Inst., Philadelphia, Pa., 50c.
 (111) *Journal of Electricity, Power and Gas*, San Francisco, Cal., 25c.
 (112) *Internationale Zeitschrift für Wasser-Versorgung*, Leipzig, Germany.
 (113) *Proceedings*, Am. Wood Preservers' Assoc., Baltimore, Md.
 (114) *Journal*, Institution of Municipal and County Engineers, London, England, 1s. 6d.

LIST OF ARTICLES

Bridges.

- Concrete Viaduct at San Diego.* (60) Sept.
 Two Large Lift Bridges at Chicago. (12) Oct. 8.
 Design of Standard Solid Deck Reinforced Concrete Trestle in Use on Illinois Central Railroad.* (86) Oct. 13.
 World's Largest Reinforced Concrete Arch Span.* Albert M. Wolf. (96) Oct. 14.
 Rebuilding the Burlington's Platte River Bridge.* J. H. Merriam. (13) Oct. 14.
 Quebec-Bridge Camp and Yards.* (13) Oct. 14.
 Reinforced-Concrete Viaduct at St. Louis, Mo.* Charles W. Martin. (13) Oct. 14.
 The Largest Arch Bridge in the World: Direct Rail Connection Between New England and the South and West.* (46) Oct. 16; (18) Oct. 9; (14) Oct. 9; (13) Oct. 7.
 Earth-Backed Abutments for Concrete Arches.* (13) Oct. 21.

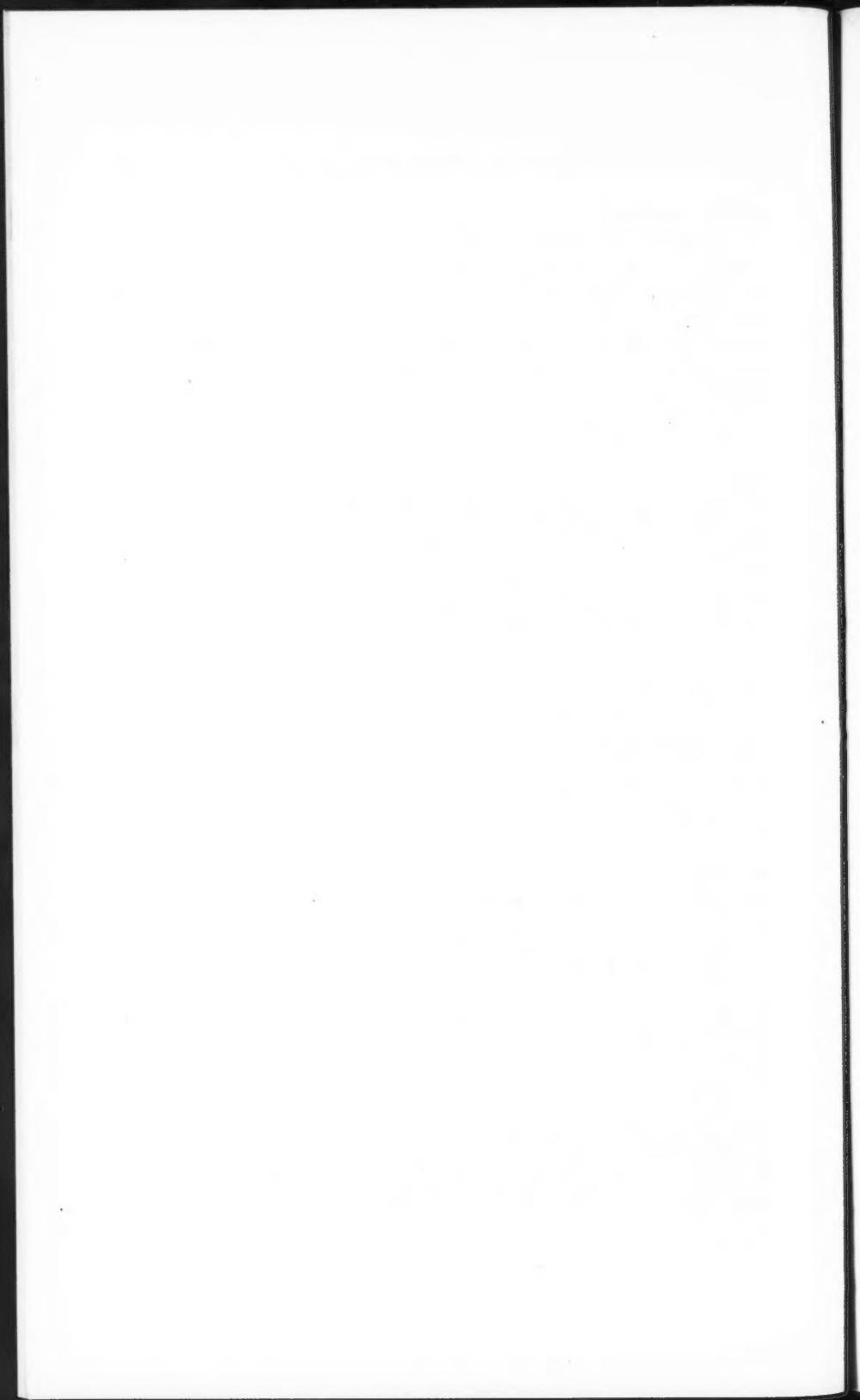
* Illustrated.

Bridges—(Continued).

- Slip of Approach Embankment Damages Concrete Bridge.* Arthur T. Clark. (13) Oct. 21.
- Ornamental Bridge at Akron Built of Slag Concrete.* (13) Oct. 21.
- A Bridge Curio Fails, Are all Failures Fortuitous? (14) Oct. 21.
- Pile and Timber Trestle Bridges. (Report of Committee of the Am. Ry. Bridge and Bldg. Assoc.) (15) Oct. 22.
- Reinforced Concrete Bridges. (Report of Committee of the Am. Ry. Bridge and Bldg. Assoc.) (15) Oct. 22.
- Concrete Highway Bridges: Some Data on Highway Bridges in Illinois. (86) Oct. 27.
- Steel Arch Highway Bridge in the Hudson Highlands.* (13) Oct. 28.
- Portland Harbor Bridge.* (13) Oct. 28.
- Completing the Summit Cut-Off of the Lackawanna.* (15) Oct. 29.
- Le Pont-Levant de Louisville sur le Canal de Louisville à Portland (Kentucky, E.-U.)* (33) Oct. 9.
- Beitrag zur Bestimmung der Bogenform bei Wölbbrücken.* R. Doorenz. (78) Oct. 4.

Electrical.

- Constant Voltage Operation of a High Voltage Transmission System. L. A. Herdt and E. G. Burr. (5) Vol. 29, Pt. 1.
- Gas and Electric Street Lighting, a Comparison of Cost and Efficiency.* (60) Sept.
- Efficiency of Loaded Telephone Lines. E. E. Detritsch. (From the *Telephone Engineer.*) (73) Sept. 24.
- Manchester Electricity Supply.* S. L. Pearce. (Paper read before the British Assoc.) (11) Sept. 24; (47) Oct. 1.
- Electric Oscillations in Coupled Circuits, a Class of Particular Cases.* W. H. Eccles and A. J. Makower. (Paper read before the British Assoc.) (73) Sept. 24.
- Decomposing Magnetic Fields into Their Higher Harmonics.* H. Weichsel. (42) Oct.
- Automatic Control. C. W. Place. (42) Oct.
- Experimental Data Concerning the Safe Operating Temperature for Mica Armature-Coil Insulation.* F. D. Newbury. (42) Oct.
- The Repulsion Start Induction Motor.* James L. Hamilton. (42) Oct.
- The Effect of Displaced Magnetic Pulsations on the Hysteresis Loss of Sheet Steel. L. W. Chubb and Thomas Spooner. (42) Oct.
- The Unsymmetrical Hysteresis Loop.* John D. Ball. (42) Oct.
- Recent Results Obtained from the Preservative Treatment of Telephone Poles.* F. L. Rhodes and R. F. Hosford. (42) Oct.
- Rates and Rate Making.* Paul M. Lincoln. (42) Oct.
- Single-Phase Squirrel-Cage Motor. Val A. Flynn. (42) Oct.
- The Calculation of the Long Distance Transmission Line Under Constant Alternating Voltage. George R. Dean. (42) Oct.
- Direct-Current Motor Speed Regulation by Resistance in the Armature Circuit, with Special Reference to the Diverter Method.* Thomas Carter. (73) Serial beginning Oct. 1.
- The Magnetostriction and Resistance of Iron and Nickel.* C. W. Heaps. (Abstract of paper from the *Physical Review.*) (73) Oct. 1.
- Motors Operated Under Modified Conditions.* Gordon Fox. (64) Oct. 5.
- Mitigation of Electrolysis. (96) Oct. 7.
- Conduction of Electricity Through Metals. J. J. Thomson. (Abstract of paper read before the Physical Soc.) (73) Oct. 8.
- The Effect of Hydro-Electric Power Transmission Upon Economic and Social Conditions, with Special Reference to the United States of America. Frank G. Baum. (Abstract of paper read before the Inter. Eng. Congress.) (73) Oct. 8; (64) Oct. 26.
- Metropolitan Needs and Sizes of Prime Movers.* (27) Oct. 9.
- Long Distance Wireless Telephony.* (46) Oct. 9.
- The First Installation of Bare Concentric Wiring in America.* (27) Oct. 9.
- Selling Current on a Small Margin.* Thomas Wilson. (64) Oct. 12.
- Thermal Characteristics and Intermittent Rating.* (73) Serial beginning Oct. 15.
- The Estimation of the Dispersion Coefficient of Three-Phase Induction Motors and Its Application to Their Design. E. A. Biedermann. (73) Serial beginning Oct. 15.
- Arcing Characteristics of Air-Break Switches.* Charles E. Bennett. (27) Oct. 16.
- Trigonometric Expressions for the Phenomena Occurring in Long-Distance Transmission Lines. V. Karapetoff. (27) Serial beginning Oct. 16.
- Fort Wayne Station Rebuilt.* Thomas Wilson. (64) Oct. 19.
- Oil Pumps and Bearings of the Curtis Motor.* Fred H. Colvin. (72) Oct. 21.
- Green Creek Hydroelectric Development.* Herbert E. Linden. (111) Oct. 23.
- Recent Advances in Wireless Measuring Instruments.* Herbert T. Wade. (46) Oct. 23.
- Electricity in Agriculture.* Carl J. Rohrer. (From *General Electric Review.*) (19) Serial beginning Oct. 23.



Electrical—(Continued).

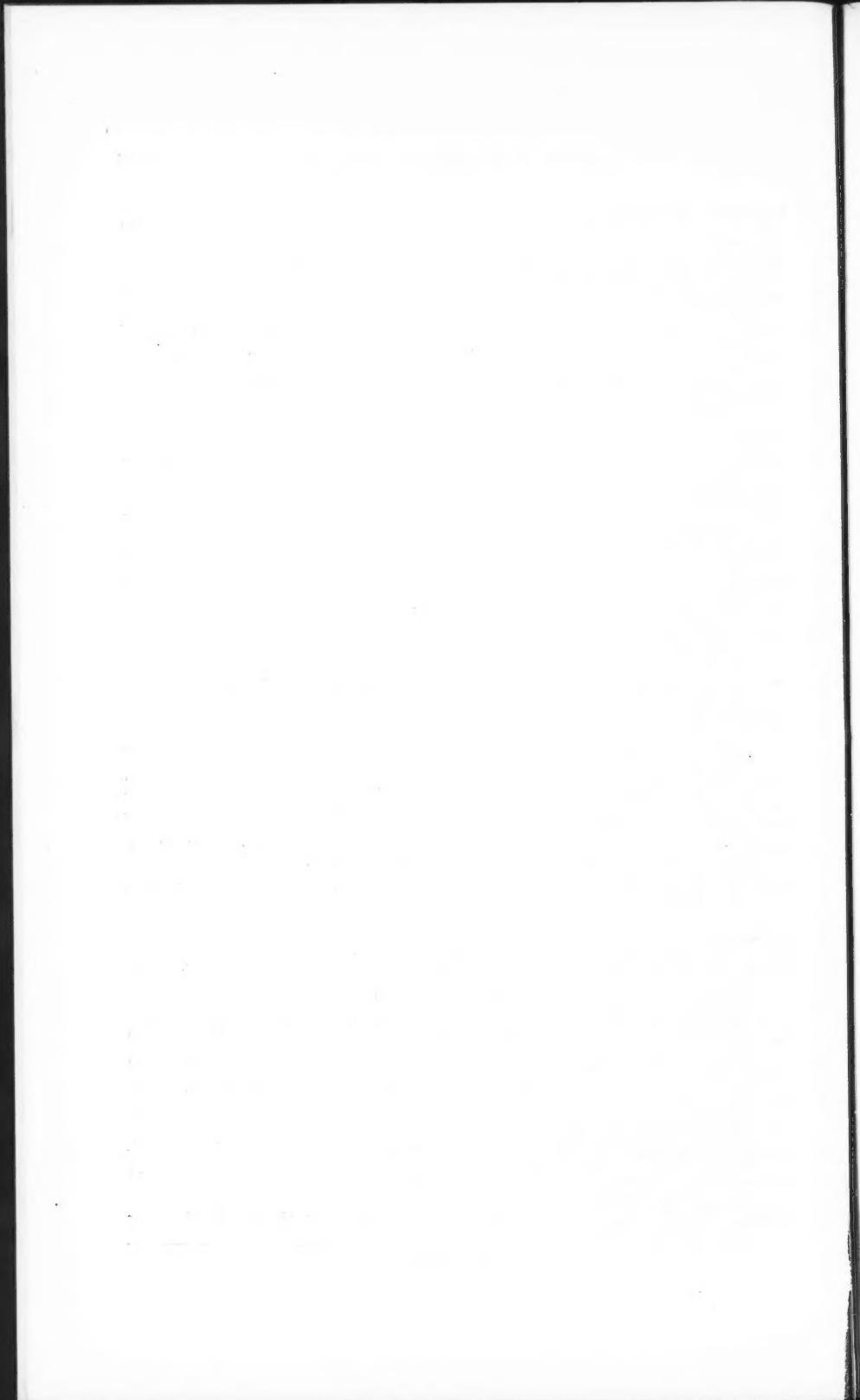
- New Penn Central Power Co.'s Williamsburg Plant.* Warren O. Rogers. (64) Oct. 26.
 Building a Power Station Upon One in Service.* (27) Oct. 30.
 Berechnung der Amperewindungen der Zähne. J. Sumeč. (41) Aug. 19.
 Die Ziehverfahren für Wolframdrähte.* (41) Sept. 16.
 Gesichtspunkte für die Konstruktion von tragbaren Isolationsmessern.* J. F. van Lonkhuyzen. (41) Sept. 16.
 Ueber die neueren elektrischen Glühlampen mit Gasfüllung. M. Pirani und A. R. Meyer. (41) Serial beginning Sept. 23.
 Ueber ein mechanisches Modell einer elektrischer Leitung.* F. Breisig. (41) Oct. 7.
 Ueber Sehnenwicklung bei Gleichstromankern.* Fr. Leyerer. (41) Oct. 7.
 Versuche mit einem Drehstrom-Gleichstrom-Umformer von 3 000 kw.* Carl Fred Holmboe. (41) Oct. 14.

Marine.

- Stability of Vessels as Affected by Damage Due to Collision. William Gatewood. (91) Vol. 22.
 The Thermodynamics of the Marine Oil Engine. John F. Wentworth. (91) Vol. 22.
 Launching Data for a Battleship. John G. Tawresey. (91) Vol. 22.
 Safety of Life at Sea: Application of Subdivision Rules Adopted at International Conference. James Donald. (91) Vol. 22.
 Safety of Life from Fire at Sea. W. O. Teague. (91) Vol. 22.
 Some Experiments with Models Having Radical Variations of After Sections. D. W. Taylor. (91) Vol. 22.
 Submarine Signaling and a Proposed Method of Safe Navigation in Fog.* F. L. Sawyer. (91) Vol. 22.
 Our First Frigates: Some Unpublished Facts About Their Construction.* Franklin D. Roosevelt. (91) Vol. 22.
 Recent Developments in Submarine Signaling.* J. B. Millet. (91) Vol. 22.
 International Conference on Safety of Life at Sea. E. T. Chamberlain. (91) Vol. 22.
 The Applicability of Electrical Propulsion to Battleships, together with the Experience Gained with it on the *Jupiter*.* S. M. Robinson. (91) Vol. 22.
 Refueling Warships at Sea.* Spencer Millar. (91) Vol. 22.
 Message from the President of the United States Transmitting an Authenticated Copy of the International Convention Relating to Safety of Life at Sea, the Detailed Regulations Thereunder, a Final Protocol, and the "Vœux" Expressed by the Conference, all Signed at London, January 20, 1914. (91) Vol. 22.
 Heat-Transmission and Tube Length in Marine Feed-Water Heaters.* Leo Loeb. (Abstract of paper read before the Am. Soc. of Naval Engrs.) (47) Sept. 3.
 The Turbine Installation on Torpedo-Boats of the New Spanish Navy.* (12) Oct. 1.
 Submarines and Torpedoes. C. N. Hinkamp. (Abstract from *Journal*, Am. Soc. of Naval Archts.) (13) Oct. 7.
 Salvage of the Submarine F-4, How the Vessel was Recovered from a Depth of 300 Feet by Naval Constructor J. A. Furer.* (46) Oct. 16.
 La Manoeuvre du Sous-Marin.* (33) Sept. 25.
 Eine neue Riesen-Blechbiegemaschine für Schiffbauzwecke, Bauart Loof.* W. Loof. (48) Sept. 25.

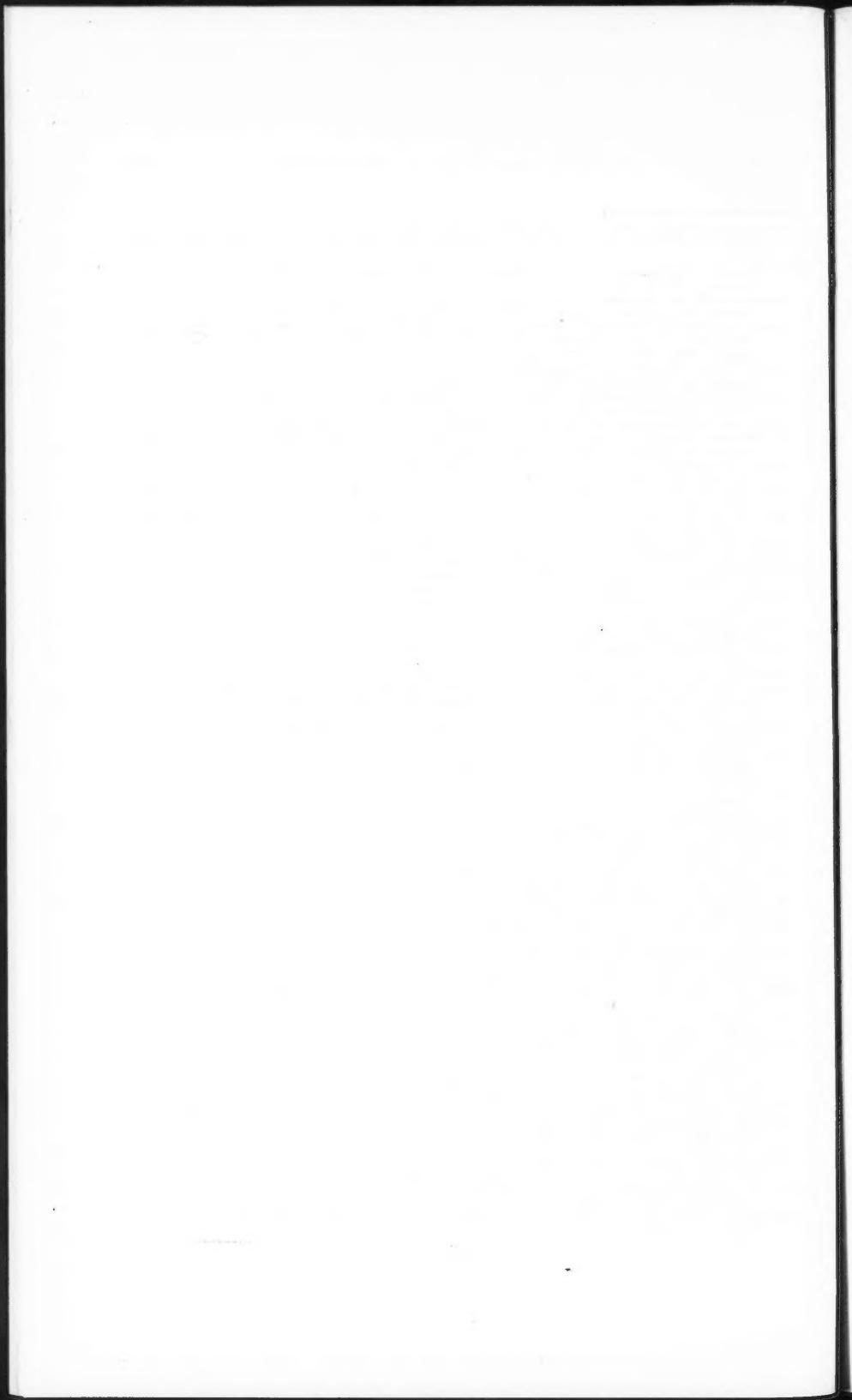
Mechanical.

- Convertible Combustion Engines.* Alan E. L. Chorlton. (75) Jan.
 Standardization of Pipe Flanges and Flanged Fittings.* John Dewrance. (75) Jan.
 Distribution of Heat-Energy and Frictional Losses in Internal-Combustion Engines.* John Eustice. (75) Jan.
 A Graphical Method of Finding Inertia Forces.* William J. Duncan. (75) Jan.
 The Distribution of Heat in the Cylinder of a Gas-Engine.* A. H. Gibson. (75) Jan.
 On the Steady Flow of Steam Through a Nozzle or Throttle. H. L. Callendar. (75) Jan.
 The Superheating of Steam at Mine and Smelter Plants.* C. A. Tupper. (82) Aug. 28.
 The Manufacture of Cast-Iron Pipes. Ralph Bates. (Paper read before the Nottingham Soc. of Engrs.) (47) Sept. 3.
 Comparative Efficiency of Lubricants. J. Veitch Wilson. (Paper read before the Inst. of Mar. Engrs.) (47) Sept. 24.
 Steam-Turbine Blading.* W. B. Parker. (Paper read before the Inst. of Metals.) (11) Serial beginning Sept. 24; (47) Sept. 24.
 Plrn Winding Machinery.* (11) Sept. 24.
 Moulding Jobbing Pipes.* James Hogg. (Paper read before the British Foundrymen's Assoc.) (47) Sept. 24.



Mechanical—(Continued).

- Firing with Coal Dust. E. B. Wilson. (45) Oct.
 A Possible Substitute for Acetylene in Welding and Cutting. J. F. Springer. (25)
 Oct.
- Mechanical Engineering at the Panama-Pacific International Exposition.* G. W. Dickie. (55) Oct.
- Compressed-Air Haulage in a Scottish Colliery.* Richard McPhee. (Paper read before the National Assoc. of Colliery Managers.) (22) Oct. 1.
- How Can Gas and Electric Companies Under One Management Render the Best Light Service? A. B. Spaulding and N. H. Potter. (Paper read before the Illuminating Eng. Soc.) (24) Oct. 4.
- Pilot Flame Ignition of Incandescent Gas Lamps.* C. W. Jordan. (Paper read before the Illuminating Eng. Soc.) (24) Oct. 4.
- The Up-Keep of Mechanical Units in Large Gas Plants. C. A. Jefferis. (Paper read before the Canadian Gas Assoc.) (24) Oct. 4.
- Notes on Overhauling the Ammonia Compressor.* F. E. Matthews. (64) Oct. 5.
- A Thermal Study of the Carbonization Process.* Harold Hollins. (Paper read before the Chemical Soc.) (66) Oct. 5.
- Some Considerations as to Calorific Value and Calorific Standards. J. T. Dunn. (Paper read before the North of England Gas Managers' Assoc.) (66) Oct. 5.
- The Elswick Works of the Newcastle-upon-Tyne and Gateshead Gas Company.* (66) Oct. 5.
- Unit Costs of Steam Shovel Work in Cuba. Julius M. Bischoff, Assoc. M. Am. Soc. C. E. (86) Oct. 6.
- Design of Skew-Bevel Gears.* Reginald Trautschold. (72) Oct. 7.
- The Electric Furnace in the Foundry. James H. Gray. (Paper read before the Am. Foundrymen's Assoc.) (20) Serial beginning Oct. 7.
- Laying District Heating Service Mains. (Report of Underground Construction Committee of the National District Heating Assoc.) (101) Oct. 8.
- Some Problems in Burning Powdered Coal.* Arthur S. Mann. (From *General Electric Review*.) (47) Oct. 8.
- Boiler Economy. (From Memorandum of the Chief Engr. of the Manchester Steam Users' Assoc.) (22) Oct. 8; (47) Oct. 8.
- Costs on Cooling-Pond Construction.* (27) Oct. 9.
- Recent Developments in the Doherty Washer Cooler as a Gas Condenser.* R. B. Rowley. (Paper read before the Michigan Gas Assoc.) (24) Oct. 11; (83) Oct. 15; (66) Oct. 19.
- Refrigeration in France. L. Marchis. (Abstract of paper read before the Inter. Eng. Congress.) (64) Oct. 12.
- Coal and Coke Conveying Plant at the Obuda Gas-Works, Budapest.* Viktor Schön. (Paper read before the Gas and Water Engrs. of Austria-Hungary.) (66) Oct. 12.
- The Diesel Engine in America.* Max. Rotter. (Paper read before the Inter. Eng. Congress.) (64) Oct. 12.
- The Design of Sliding Bearings.* E. H. Fish. (72) Oct. 14.
- Carbonizing with Verticals at Ottawa. A. A. Dion. (Paper read before the Canadian Gas Assoc.) (83) Oct. 15.
- Blue Water-Gas and Deep-Fuel Combustion. Arthur Graham Glasgow. (Paper read before the Inter. Gas Congress.) (83) Oct. 15.
- The Isolation of Vibrational Disturbances.* Francis H. Davies. (26) Oct. 15.
- The Coming of the Motor Plough. (12) Oct. 15.
- Electric Welding. C. B. Auel. (Abstract of paper read before the Inter. Eng. Congress.) (73) Serial beginning Oct. 15.
- Aeroplane Engines. Neil MacCoul, Jr. (Paper read before the Soc. of Automobile Engrs.) (19) Oct. 16.
- Filtering Oil in the Power Plant.* (19) Oct. 16.
- Domestic Lighting.* J. D. Shattuck. (Paper read before the Inter. Gas Congress.) (24) Oct. 18.
- New Apparatus for the Manufacture of Aqua Ammonia from Raw Gas Liquor.* R. W. Hilgenstock. (24) Oct. 18.
- Controlling Temperatures in Down Draft Kilns. C. O. Arbogast. (76) Serial beginning Oct. 19.
- Spray Cooling Systems. Lee H. Parker. (Paper read before the National Assoc. of Cotton Manufacturers.) (64) Oct. 19.
- The Ideal Brick Plant Electrically Driven. (76) Oct. 19.
- Methods Employed in Field-Coating Two Pipe Lines, Applying Bitumastic Enamel with Special Machines. (86) Oct. 20.
- Foundry Construction for Light Castings.* (20) Oct. 21.
- Pennsylvania Railroad's Industrial Trucks.* T. V. Buckwalter. (Paper read before the Elec. Vehicle Assoc.) (17) Oct. 23; (15) Oct. 22.
- Gas as a Case-Hardening Agent.* Alfred H. White and Homer T. Wood. (Paper read before the Michigan Gas Assoc.) (24) Oct. 25.
- Industrial Fuel. F. W. Frueauff. (Paper read before the Inter. Gas Congress.) (24) Oct. 25.



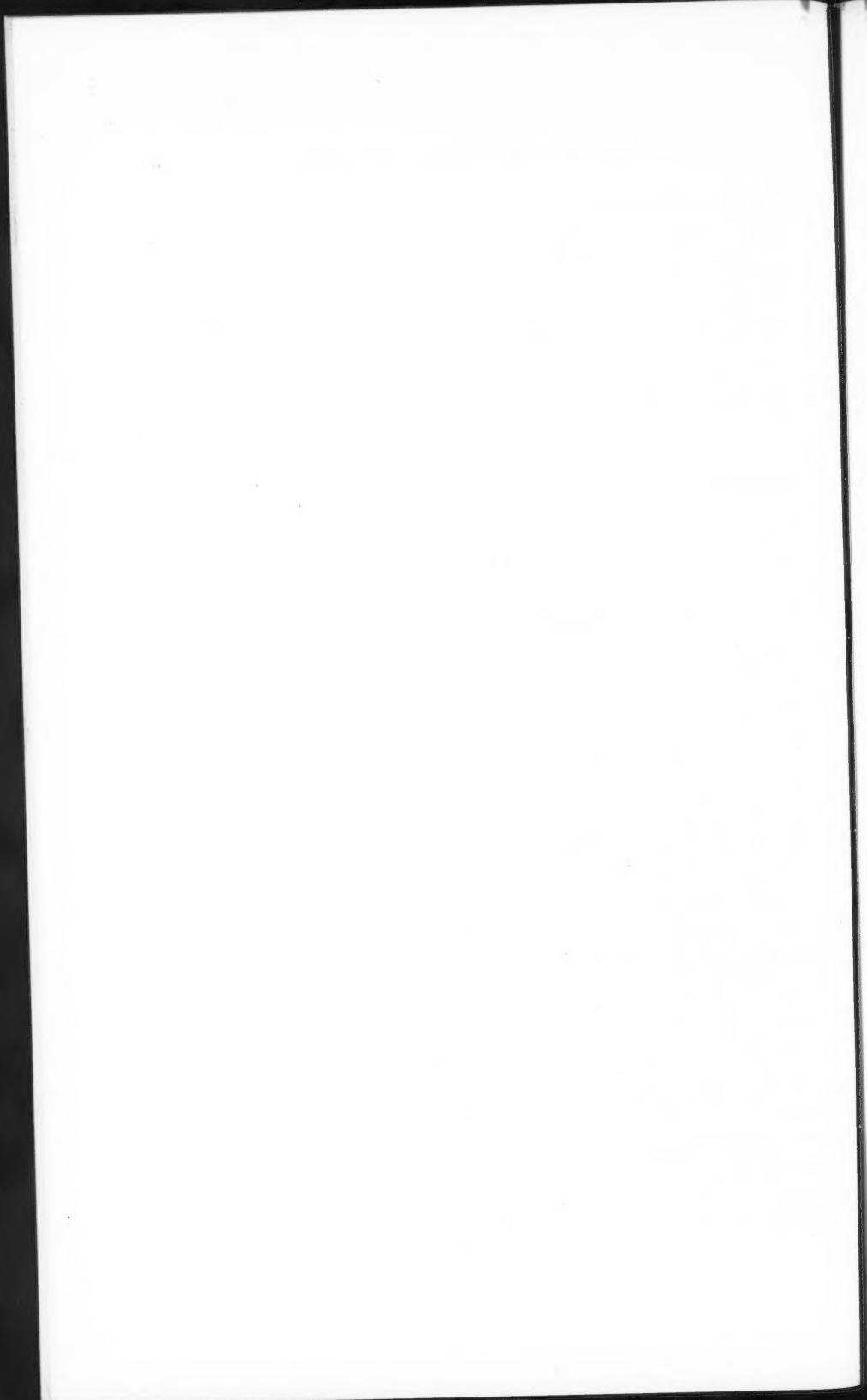
Mechanical—(Continued).

- Superheat in Vertical Fire-Tube Boilers.* Stanley P. Stewart. (64) Oct. 26.
 Handling Bricks with Gravity Roller Conveyors.* W. B. Conant. (13) Oct. 28.
 Firing Various Fuels in Residence Heaters. L. P. Breckenridge and S. B. Flagg.
 (From Technical Paper No. 97 of the Bureau of Mines.) (101) Oct. 29.
 Long 15-Ton Guy Derrick Folds into Compact Form.* (14) Oct. 30.
 The Great Gas Tunnel Under the East River.* J. F. Springer. (46) Oct. 30.
 The Utilization of Exhaust Steam.* O. Bechstein. (Abstract from *Prometheus*.)
 (19) Oct. 30.
 Flooding and Recovery of the Astoria Tunnels.* Harold Carpenter. (83) Nov. 1.
 Die Verein Lagerplätze Haggen-Bruggen bei St. Gallen.* H. Sommer. (107)
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 Lokomobilanlage. (53) Serial beginning Sept. 17.
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 Ueber Formsand-Aufbereitung.* Willibald Schwab. (53) Serial beginning Oct. 1.
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Metallurgical.

- Researches on the Iron, Silicon, and Carbon Alloys.* Georges Charpy and André Cornu-Thénard. (71) Vol. 91.
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 The Diffusion of Carbon in Iron.* F. W. Adams. (71) Vol. 91.
 On the Nature of the A-2 Transformation in Iron.* Kōtarō Honda. (71) Vol. 91.
 Iron, Carbon, and Phosphorus.* J. E. Stead. (71) Vol. 91.
 The Thermo-Electric Properties of Special Steels.* Eugene L. Dupuy and Albert M. Portevin. (71) Vol. 91.
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 Reference to Belgian Practice.* H. Hubert. (71) Vol. 91.
 Record of the Discovery of the Influence of Vanadium on Steel. J. O. Arnold. (71)
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 Note on the Heating of an Open Hearth Furnace by Means of Tar. A. Greiner.
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 History of the Metallurgy of Iron and Steel.* Robert A. Hadfield. (75) Jan.
 The Chemical and Mechanical Relations of Iron, Cobalt, and Carbons.* J. O. Arnold
 and A. A. Read. (75) Jan.
 Recent Progress in Metallography. William Campbell. (6) Apr.
 Use of Electricity in Melting Brass.* Herbert G. Dorsey. (Paper read before the
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 Why is Flotation? Charles T. Durell. (103) Sept. 18.
 Ore Dressing on the Mother Lode.* E. S. Pettis. (103) Sept. 18.
 The Geltens Process of Treating Refractory Ores. G. A. Geltens. (82) Sept. 25.
 Grades and Kinds of Oil for Flotation Processes.* (82) Sept. 25.
 The Magnetic Properties of Some Iron Alloys Melted in Vacuo.* Trygve D. Yensen.
 (42) Oct.; (73) Oct. 15.
 Progress in the Iron and Steel Industry and the Electric Furnace. Karl George
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 A Thermostat for Moderate and High Temperatures.* John L. Haughton and D.
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 Use of Coal Tar in Flotation. William A. Mueller. (16) Oct. 9.
 Thermal Principles of the Blast Furnace. J. E. Johnson, Jr. (105) Serial begin-
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 C. Terry du Rell. (105) Oct. 15.
 The Electrolysis of Copper Sulphate Liquors, Using Carbon Anodes.* Lawrence
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 Coarse-Crushing Plant of 1 000 Tons Capacity.* G. O. Bradley. (Paper read before
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 Simple Cyanide-Plant Design.* S. A. Worcester. (16) Oct. 16.
 Wright Concentrating Table.* C. W. Wright. (16) Oct. 16.

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- Heat Treatment of Iron and Steel.* Alfred H. White and Homer T. Hood. (Papers read before the Michigan Gas Assoc.) (66) Oct. 19.
 The Cost of Electric Furnace Steel.* F. T. Snyder. (Paper read before the Am. Electrochemical Soc.) (20) Oct. 21.
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 Control of Piping and Segregation in Ingots.* Henry M. Howe. (Paper read before the Am. Iron and Steel Inst.) (20) Oct. 23.
 Heat Treatment in Automatic Electric Furnaces. Thaddeus F. Baily. (Paper read before the Am. Iron and Steel Inst.) (20) Oct. 28.
 Mechanical Development in Sintering Materials.* Bethune G. Klugh. (Paper read before the Am. Iron and Steel Inst.) (20) Oct. 28.
 Quelques Progrès de la Métallurgie en 1913 et 1914.* L. Durand. (93) May.
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 Versuche am Winderhitzern.* Peter Pape und Otto Johannsen. (50) July 22.
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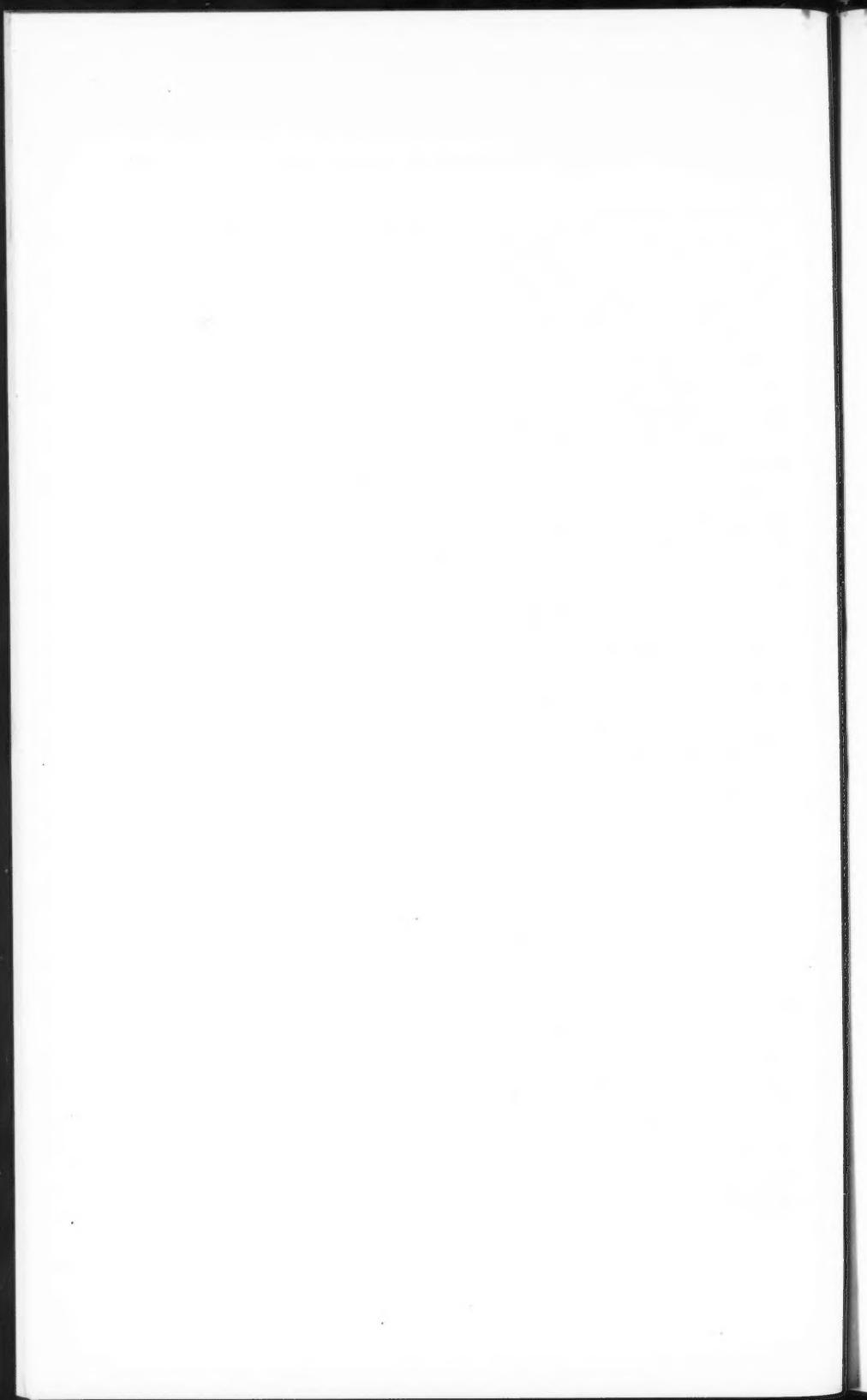
Military.

- Temporary Buildings for Military Purposes.* G. Bertram Hartree. (104) Serial beginning Sept. 24.
 Recent Progress in Military Aeronautics. Samuel Reber. (3) Oct.
 Machining High-Explosive Shells.* C. A. Tupper. (20) Oct. 7.
 Electricity in Submarine Mining.* M. Antoniaieff. (From *Electritchestvo*) (26) Oct. 8.
 The Scissors Periscope.* (19) Oct. 9.
 The Gun and the Aeroplane. Blamire Young. (From Engineering Supplement of *London Times*.) (19) Oct. 30.
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 Construction Graphique de la Trajectoire d'un Projectile.* P. Caufourier. (33) Oct. 9.
 Die Wasserstoffgewinnung im Kriege.* A. Sander. (53) Serial beginning Sept. 10.

Mining.

- The Evolution of Stoping Methods During the Last Decade.* C. A. Macaulay. (5) Vol. 29, Pt. 1.
 Basic Principles of Mining Cost. James R. Finlay. (6) Apr.
 Tables for the Determination of Gems and Precious or Ornamental Stones Without Injury to the Specimen. Alfred J. Moses. (6) Apr.
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 Mining Activity on the Iron Ranges.* Geo. E. Edwards. (82) Sept. 4.
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 A Notable Electric Winder (for Colliery).* H. Bramwell. (Paper read before the South Wales Inst. of Engrs.) (73) Sept. 24.
 Use of Gunite in Underground Mine Work.* Stephen Royce. (Paper read before the Lake Superior Min. Inst.) (82) Sept. 25.
 Practical Economy at Coal Mines. Lehman G. Hauger. (45) Oct.
 Welfare Work of the Frick Coke Co.* (45) Oct.
 Early Days of Coal Mining in Illinois. Walton Rutledge. (45) Oct.
 A Protective System for Coal Mines.* N. D. Levin. (45) Oct.
 The Bisbee-Warren District Copper Queen Mine.* C. A. Tupper. (82) Oct. 2.
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 Hoisting Works in the Park City District, Utah.* L. O. Howard. (103) Serial beginning Oct. 9.
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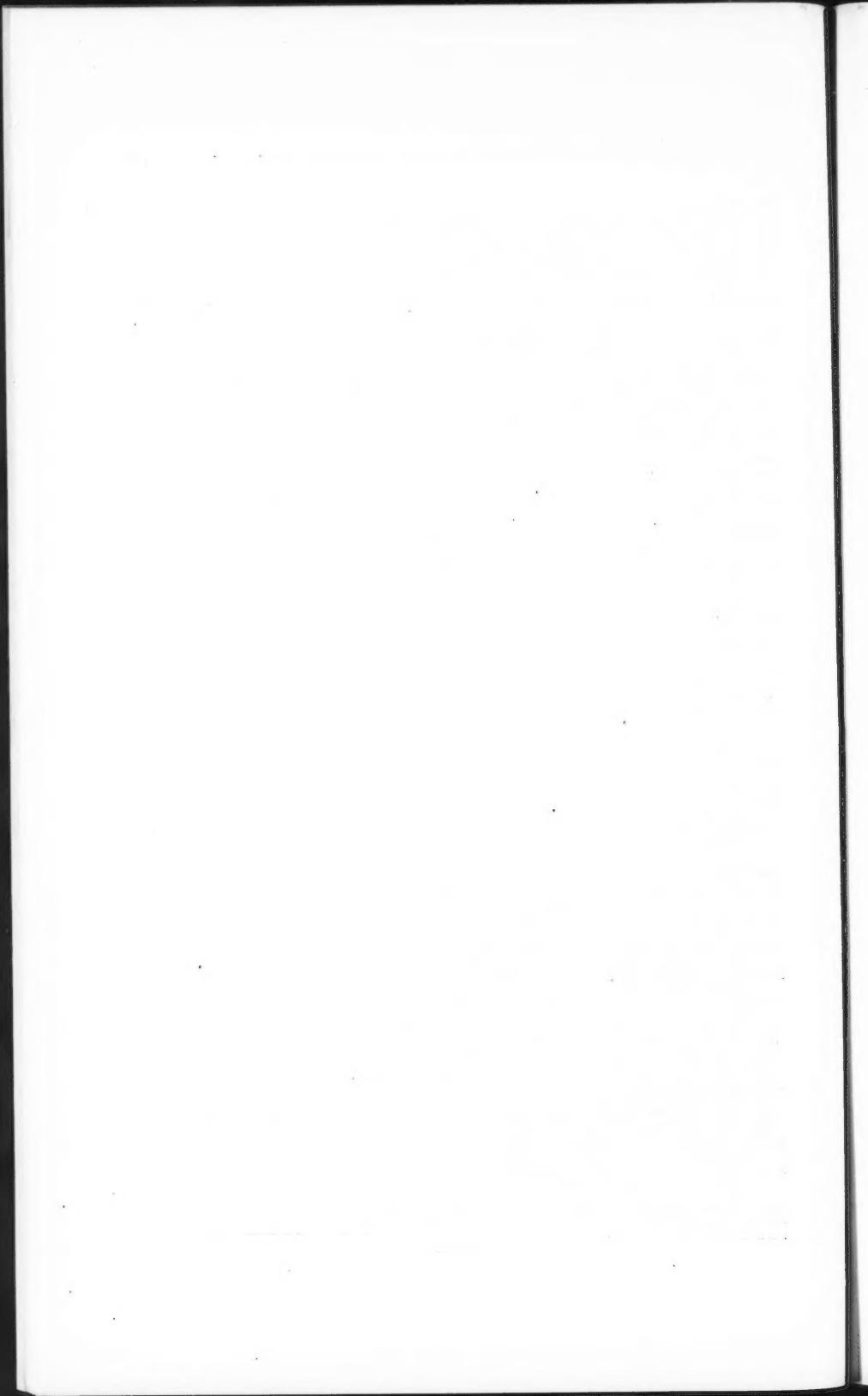
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- The Engineer and the Public. C. E. Drayer. (98) Sept.
 Potash from Pacific Coast Kelp. Thomas H. Norton. (82) Sept. 4.
 Geology as an Aid to Tropical Engineering.* Warren D. Smith. (103) Sept. 18.
 The Establishment of Photometry on a Physical Basis. Herbert E. Ives. (3) Oct.
 The Engineering Experiment Station of the University of Illinois. Ellery B. Paine.
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 Municipal Co-Operation in Public Utility Management. Philip J. Kealy. (42)
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 Graphs, Charts and Statistics as Aids to Administration. E. C. Stothart. (Abstract
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 Law and Engineering, Some Points of Contact. Sydney G. Turner. (Paper read
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 The Evils of Government Ownership. Jonathan Bourne, Jr. (Paper read before the
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 Measuring Heat by Small Electromotive Forces. F. G. Coburn. (72) Oct. 14.
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 Vulcanized Fibre.* Charles Almy, Jr. (105) Oct. 15.
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 The Engineering Contractor. Halbert P. Gillette. (Paper read before the Am.
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 Handy Book-form Data Sheet for Valuation Work.* Robert E. Klotz. (13)
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 Manila Rope. F. E. Weise. (Paper read before the Am. Ry. Bridge and Bldg.
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 Control and Regulation Versus Government Ownership. Theodore N. Vail. (Paper
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 How Shall Patented Materials or Processes on Public Works be Handled? (14)
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 Why Appraisal is not Valuation. George Sydney Binckley. (14) Oct. 23.
 Engineer of Modern Sugar Plantation has to Deal with Varied Problems.* Samuel
 Vickess. (14) Oct. 30.
 L'Enseignement Technique Supérieur dans les "Hochschulen" allemandes.* A.
 Bidault des Chaumes. (33) Oct. 2.

Municipal.

- Standard Specifications for Two-Course Concrete Street Pavement. (Am. Concrete
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 The Expansion and Contraction of Concrete Roads.* R. J. Wig and W. S. Gefvert.
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 Methods and Cost of Concrete Road Construction in Milwaukee County. H. J. Knell-
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 Gas and Electric Street Lighting, a Comparison of Cost and Efficiency.* (60) Sept.
 Concrete Road with a Single Crack in 4½ Miles.* (67) Oct.
 Erick Monolithic Construction of County Highways.* Rodney L. Bell. (Paper
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 Uniformity in Highway Data. H. E. Breed. (Abstract of paper read before the
 Pan-American Road Congress.) (96) Oct. 7.
 Ohio Uses Cement-Sand Support for Brick Pavement. D. Moomaw. (14) Oct. 9.
 Rigid Bed Eliminates Noise and Subsurface Pockets. F. A. Churchill. (14) Oct. 9.
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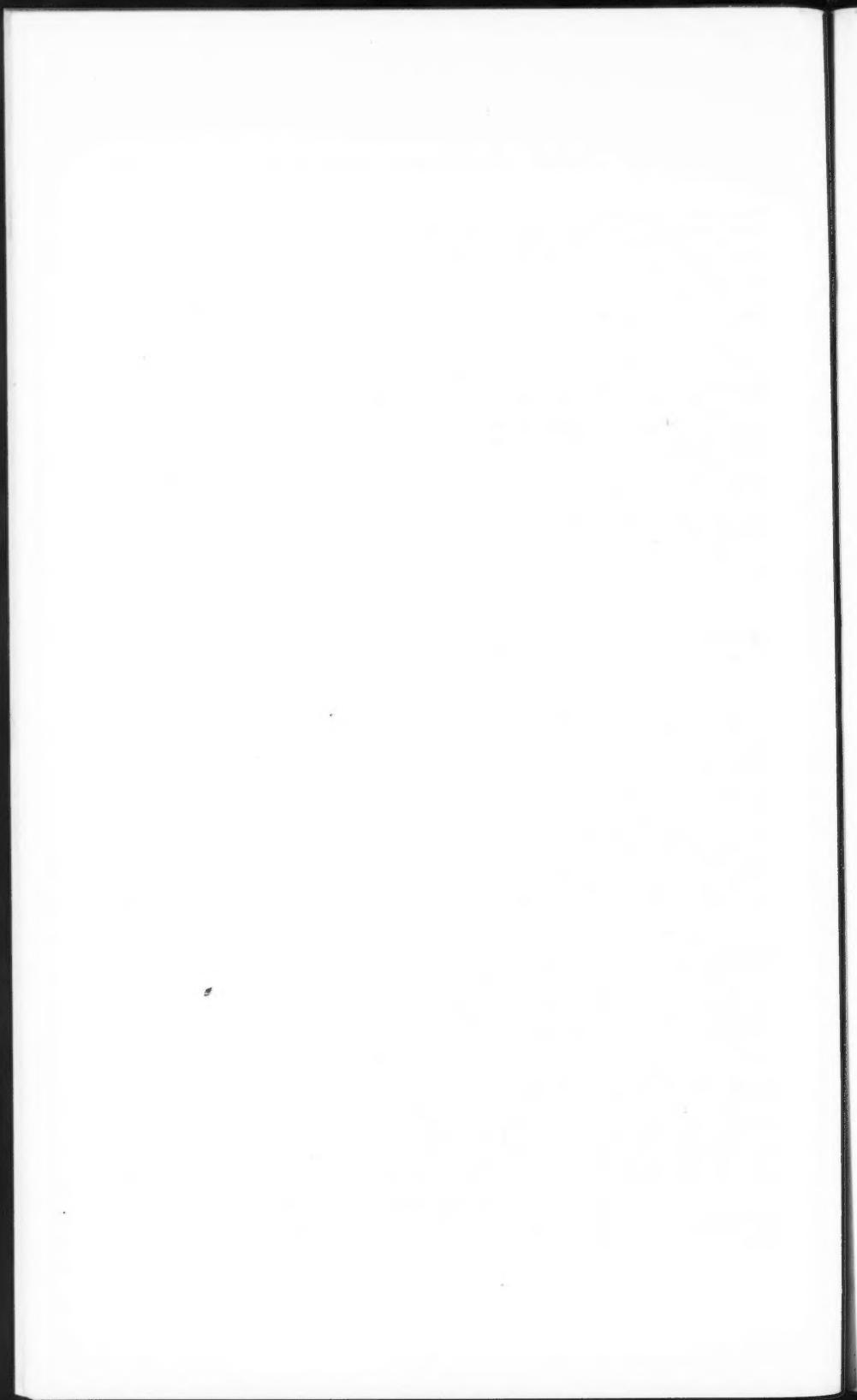


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- Some Bituminous Pavement Costs. R. G. McMullen. (Paper read before the Oregon Soc. of Engrs.) (96) Oct. 14.
- Rural Highways. Arthur Gladwell. (Paper read before the Inter. Eng. Congress.) (104) Oct. 15.
- Highway Superintendent of Cook County, Illinois, Simplifies Filing System.* (14) Oct. 16.
- Some Notes on Methods and Costs of Grouting Brick Pavements.* (86) Oct. 20.
- Wood Block Pavement in the City of Wenatchee, Wash.* F. J. Sharkey. (86) Oct. 20.
- Building Twin City Concrete Automobile Racetrack.* (13) Oct. 21.
- Tests of Smoothness made on Various Pavements.* R. D. Kneale. (13) Oct. 21.
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- Surface Warnings of Street Subsurface Failures. Robert Klotz. (13) Oct. 28.
- Brick Pavement Lasted 24 Yr.; New Pavement also Brick.* H. K. Higgins. (13) Oct. 28.
- Test Results will Form Basis for Selecting Pavements in St. Louis.* (14) Oct. 30.
- Paving Crown Best Distributed by Hyperbolic Curve. Clark R. Mandigo. (14) Oct. 30.
- Pennsylvania Builds Concrete Road as Object Lesson.* (14) Oct. 30.
- New-York's Bauordnung und Stadtbauplan.* J. Stübben. (51) Serial beginning Oct. 6.

Railroads.

- Sound Steel Ingots and Rails.* Robert A. Hadfield and George K. Burgess. (71) Vol. 91.
- The London and South-Western Railway Electrification. (11) Sept. 24; (12) Sept. 24; (23) Oct. 1; (26) Sept. 24; (73) Oct. 1.
- Baldwin Locomotives for Russia.* (23) Sept. 24.
- Caledonian Railway Ambulance Train for France.* (23) Sept. 24.
- Electric Railway for Transport of Iron Ore in Sweden.* (21) Oct.
- Ball Bearings for Railway Carriage Journals.* (21) Oct.
- Duplex Bolster Carriage Bogies and 60 Ft. Steel Underframe, Great Central Railway.* (21) Oct.
- Northern Pacific Passenger Cars.* (25) Oct.
- Steel Car Design from a Protection Standpoint. John D. Wright. (Paper read before the Master Car and Locomotive Painters' Assoc.) (25) Oct.
- Prepared Paints for Metal Surfaces. Henry H. Gardner. (Paper read before the Master Car and Locomotive Painters' Assoc.) (25) Oct.
- Repairing Driving Boxes.* P. F. Smith. (25) Oct.
- Modern Appliances on Large Locomotives. (Report of Committee of the Traveling Engrs. Assoc.) (25) Oct.
- The Federal Valuation of the Boston and Maine Railroad. F. C. Shepherd. (109) Oct.
- A Large American Triple Articulated Compound Locomotive.* (47) Oct. 1.
- Barclay Articulated Locomotive for New Zealand.* (23) Oct. 1.
- Smokeless Locomotive Operation Without Special Apparatus. H. H. Maxfield. (Paper read before the Inter. Assoc. for the Prevention of Smoke.) (18) Oct. 2; (64) Oct. 5.
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- Freight Equipment Cars for the Russian Government.* (18) Oct. 2.
- The Interstate Commerce Commission and Its Work. E. E. Clark. (Paper read before the National Industrial Traffic League.) (86) Oct. 6.
- Traction Equipment for Electrified Steam Railways. (Report of Committee of the Am. Elec. Ry. Eng. Assoc.) (96) Oct. 7.
- The Aberdeen Joint Station.* (23) Oct. 8.
- Great Eastern Railway Ambulance Train No. 20.* (23) Oct. 8.
- How French Hospital Trains Help to Save the Wounded.* Walter S. Hiatt. (15) Oct. 8.
- Pennsylvania Track Elevation Through Wilkinsburg, Pa.* (15) Oct. 8.
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- Interstate Commerce Commission Hearing on Valuation. (15) Oct. 8; (18) Oct. 9.



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- Effect of Recent Floods on Railways. (15) Oct. 22.
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- The Advantage and Cost of Spiraling Curves.* W. F. Rensch. (15) Oct. 22.
- Protection of Grade Crossings. (Report of Committee of the Am. Ry. Bridge and Bldg. Assoc.) (15) Oct. 22; (18) Oct. 23.
- Passenger Train Cars for the Northern Pacific.* (15) Oct. 22.
- Notes on Mountain Railway Electrification.* T. Castiglion. (17) Oct. 23.
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- Internal Stresses in Rails Found to be too High.* (13) Oct. 28.
- Comparative Statistics of the World's Railways. Bureau of Railway Economics. (15) Oct. 29.
- Elimination of the Tower Grove Crossings, St. Louis.* F. L. Wonson. (Paper read before the St. Louis Engrs' Club.) (15) Oct. 29.
- Detail Cost of Track Work with Steel Twin Ties.* A. J. Wolfe. (17) Oct. 30.
- Das Zugförderungs-Material der Elektrizitätsfirmen an der Schweiz. Landesausstellung in Bern, 1914.* W. Kummer. (107) Serial beginning Sept. 11.

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- Marking Safety Zones on Busy Street Crossings. James F. Hobart. (60) Sept.
- Design, Construction and Detailed Labor Costs of Car Shops for Omaha & Council Bluffs Street Railway Co., Omaha, Neb.* W. L. Fulton. (86) Oct. 6.
- Newark Terminal to Relieve Traffic Congestion.* (13) Oct. 7.
- Kansas City's New Cars.* R. L. Weber. (17) Oct. 9.
- Prepayment Cars and the Accountant. R. J. Clark. (Paper read before the Am. Elec. Ry. Accountants' Assoc.) (17) Oct. 9.
- Development of the Electric Railway. James H. McGraw. (Paper read before the Am. Elec. Ry. Assoc.) (17) Oct. 9.
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- Fares and Transfers. (Report of Committee of the Transportation and Traffic Assoc.) (17) Oct. 9.
- A Card Index and What it Means (for Street Railroads). J. J. Reynolds. (Paper read before the Claims' Assoc.) (17) Oct. 16.
- Concrete Poles in Electric Railway Work.* (Report of Committee of the Am. Elec. Ry. Eng. Assoc.) (18) Oct. 16.
- Section of New York Elevated Rebuilt under Heavy Traffic without an Accident.* (14) Oct. 16.
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- Edmonton's Tunnel Sewer System. A. J. Latornell. (5) Vol. 29, Pt. 1.
- Lethbridge Sewage Disposal Works.* A. C. D. Blanchard. (5) Vol. 29, Pt. 1.
- Measuring Drainability of Imhoff Tank Sludge. W. L. Stevenson. (Abstract of paper read before the Am. Public Health Assoc.) (13) Sept. 16.
- Substituting Heating Value for Candle Power as a Standard. R. S. McBride. (Paper read before the Inter. Eng. Congress.) (66) Sept. 28.
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- Albany Sewage-Disposal Works.* John H. Gregory. (13) Oct. 7.
- Adapted Machinery and Construction Methods Employed on New Western Ave. Sewer, Chicago, Time Studies.* Stanley E. Bates. (86) Oct. 13.

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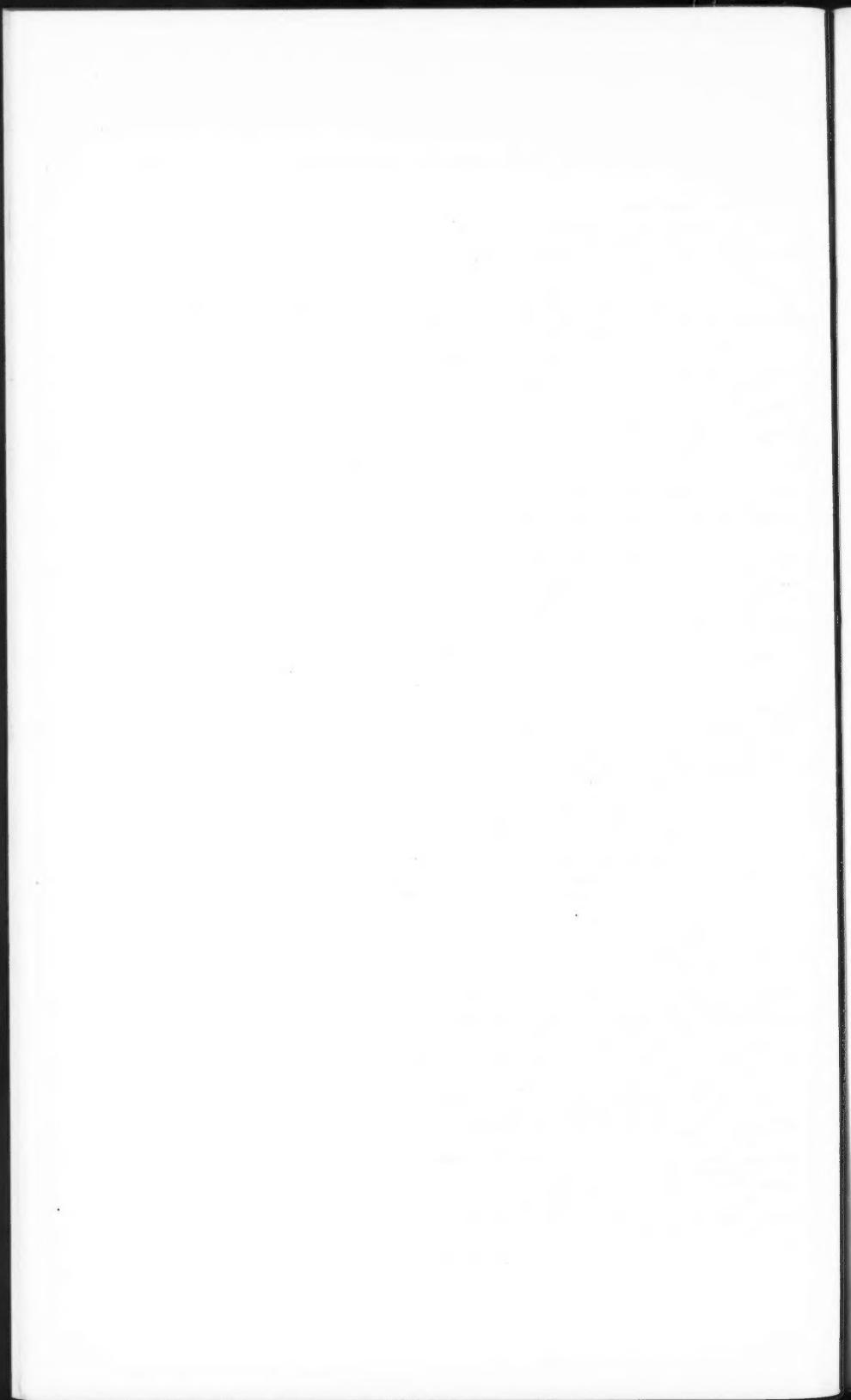
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- A Handy Method of Estimating the Cost of Constructing Pipe Sewers. W. G. Kirchoffer. (86) Oct. 13.
- Extent and Cost of Use of Motor Trucks in Municipal Refuse Collection Service. Samuel A. Greeley. (Paper read before the Am. Public Health Assoc.) (86) Oct. 13.
- Cost of Drainage Pumping in Southern Louisiana. C. W. Okey. (13) Oct. 14.
- Small Sweeping Machines for Power and Hand Operation.* (13) Oct. 14.
- Construction and Operation of Gloversville Sewage Works.* H. P. Eddy and H. J. Hanmer. (13) Serial beginning Oct. 14.
- A New Electrolytic Method of Sewage Disposal.* J. C. Olsen. (Paper read before the Am. Inst. of Chemical Engrs.) (105) Serial beginning Oct. 15.
- Sanitary Progress in Peru and Bolivia. H. J. Bingham Powell. (From *Journal of the Royal San. Inst.*) (104) Oct. 15.
- Recent Developments in Ventilation Work. D. D. Kimball. (Paper read before the Inter. Eng. Congress.) (101) Oct. 15.
- Rules for Warm-Air Furnace Installations. (National Warm Air Heating and Ventilating Assoc.) (101) Oct. 15.
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- Fall River Mills will Benefit by \$3 000 000 Water and Sewerage Project.* (14) Oct. 23.
- Sewer Gagings and Maximum Flow in a Seattle Outfall.* Henry D. Silliman. (13) Oct. 28.
- Plumbing System of Public Market Station.* (101) Oct. 29.
- A Remarkable Heating and Ventilating System that Conserves the Comfort of 15 000 Workers (Ford Plant).* (19) Oct. 30.
- Test Plant Operated to Deodorize Oil Refinery Wastes.* F. R. Hesser. (14) Oct. 30.
- Abwasser-Hebeanlagen in Fabriken und sonstigen Gebäuden.* Ernst Immerschitt. (51) Serial beginning Sept. 18.
- Sammelkanal in Eisenbeton von 200/250 cm. Lichweite.* W. Schwaab. (78) Oct. 4.

Structural.

- Stress-Strain Loops for Steel in the Cyclic State.* J. H. Smith and G. A. Wedgwood. (71) Vol. 91.
- The Relative Corrodibilities of Grey Cast Iron and Steel, with a Note on the Removal of Rust by Means of Chemical Reagents.* J. Newton Friend and C. W. Marshall. (71) Vol. 91.
- The Corrosion of Iron in Aqueous Solutions of Inorganic Salts.* J. Newton Friend and Peter C. Burnet. (71) Vol. 91.
- Brinell Hardness and Tenacity Factors of a Series of Heat-Treated Special Steels.* Andrew McWilliam and Ernest Jefferson Barnes. (71) Vol. 91.
- Tests on the Shearing Resistance of Reinforced Concrete Beams. E. Brown, H. M. MacKay and C. M. Morssen. (5) Vol. 29, Pt. 1.
- The Behavior of Riveted Joints Under Stresses. James E. Howard. (91) Vol. 22. Report of Committee on Reinforced Concrete and Building Laws (Am. Concrete Inst.),* (110) July.
- Mixing, Curing and Placing Concrete with High-Pressure Steam.* Harold P. Brown. (110) July.
- Design and Construction of the Massachusetts Institute of Technology Buildings.* Sanford E. Thompson. (110) July.
- Design of Wall Columns and End Beams.* Edward Smulski. (110) July.
- Temporary Buildings for Military Purposes.* G. Bertram Hartfree. (104) Serial beginning Sept. 24.
- The Experimental Determination of the Effect of Varying the Percentage of Water in Concrete.* R. K. Skelton. (Paper read before the Connecticut Soc. of Engrs.) (104) Sept. 24.
- Engineering Features of the Panama-Pacific International Exposition.* Guy L. Bayley. (55) Oct.
- Prepared Paints for Metal Surfaces. Henry H. Gardner. (Paper read before the Master Car and Locomotive Painters' Assoc.) (25) Oct.
- The Preparation of Gravel for Use in Concrete.* C. S. Huntington. (67) Oct.
- Protective Coatings for Metals and Methods of Applying Them.* H. B. C. Allison. (86) Oct. 6.
- Flooding and Recovery of the Astoria Tunnel.* Harold Carpenter. (13) Serial beginning Oct. 7.
- Stress Distribution in Engineering Materials.* (Report of Committee of the British Assoc.) (11) Oct. 8; (12) Oct. 8.
- Proper Regulation of Air Prevents Clogging of Pneumatic Mixers (Concrete).* H. A. Leeuw, Assoc. M. Am. Soc. C. E. (14) Oct. 9.



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- Large Saving in Steel Effected by New System of Flat-Slab Reinforcement.* (14) Oct. 9.
 Steel Penstocks and Draft Tubes Protected by Tar Paint. Barry Dibble. (From the *Reclamation Record*.) (96) Oct. 14.
 Planning of Working-Class Houses. Joseph Weekes. (Paper read before the Incorporated San. Assoc. of Scotland.) (104) Oct. 15.
 Housing in the Hemel Hempstead Rural District.* (104) Oct. 15.
 Torsion Stresses in Framed Structures.* Cyril Batho. (Paper read before the British Assoc.) (11) Oct. 15.
 Pneumatic Grain Elevating Plant.* (12) Oct. 15.
 Trussed-Steel Chute Places Concrete Economically on Slope.* Homer V. Knouse. (14) Oct. 16.
 How Consistency and Age Affect Strength of Mortar. (14) Oct. 16.
 Design, Construction and Detailed Costs of the Sliding Forms for a Reinforced Concrete Grain Storage House. Wm. Wren Hay. (86) Oct. 20.
 Results of Some Tests to Determine the Shrinkage and Time Effects in Reinforced Concrete.* Franklin R. McMillan. (Abstract from *Bulletin*, Univ. of Minnesota Eng. Experiment Station.) (86) Oct. 20.
 Methods and Equipment Used in Wrecking a 101 Ft. Steel Stack.* (86) Oct. 20.
 Eccentric Heel Joint of Roof Truss, Solution of Problem.* Edward H. Rockwell. (13) Oct. 21.
 Railroad Mixing Plant has Bins on Mixer Car Fed by Crane. (Concrete.)* M. B. Uhlrich. (14) Oct. 23.
 Diagram Facilitates Estimating Weight of Steel in Concrete.* Albert M. Wolf. (14) Oct. 23.
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 The Development of Commercial Alloy Steels. Edgar D. Rogers. (Paper read before the Am. Iron and Steel Inst.) (20) Oct. 28.
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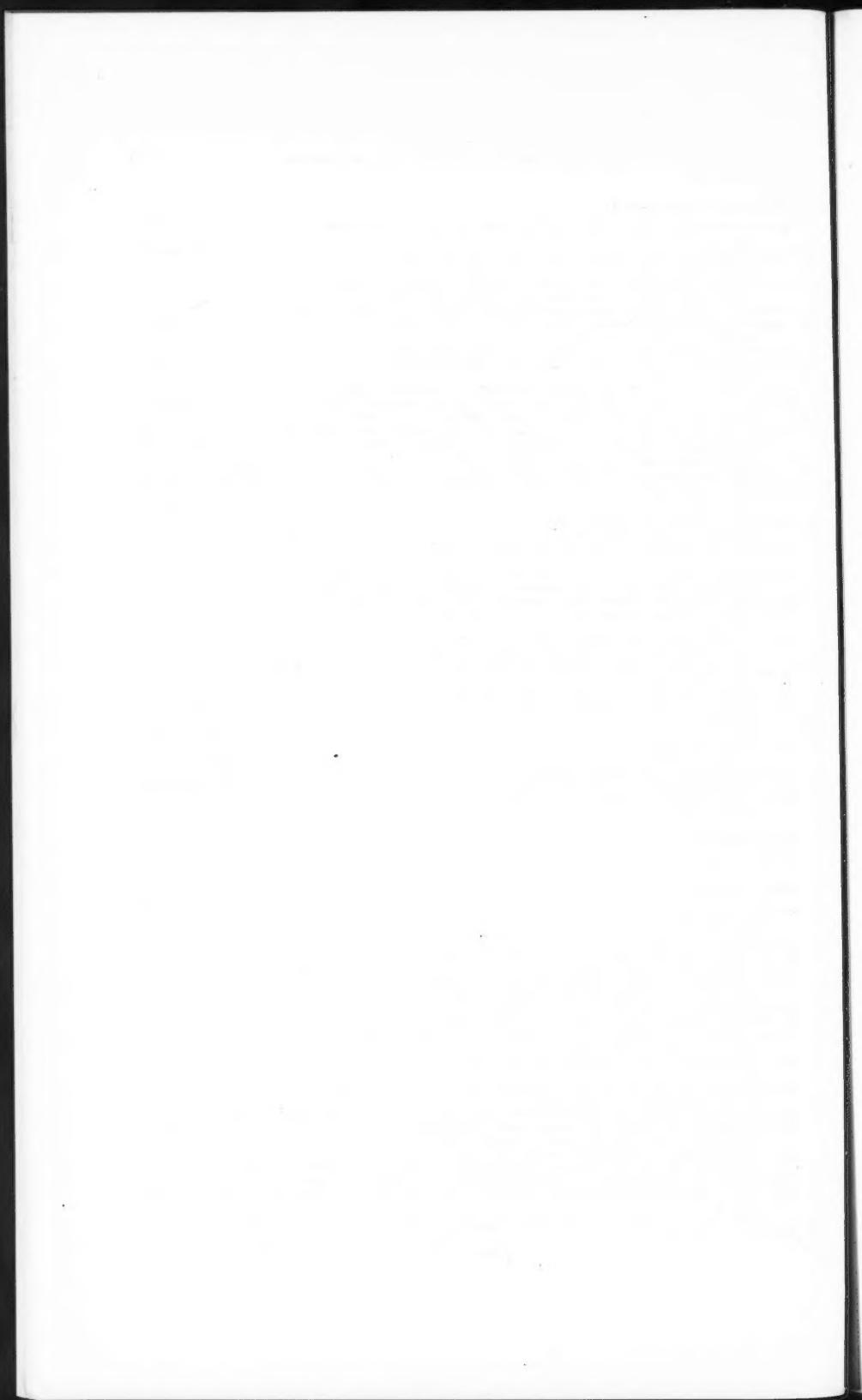
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Summer Survey 1915.* J. C. Tunnicliff. (36) Oct.

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- Jordan River Power Development, Vancouver Island, B. C.* Charles A. Lee. (5) Vol. 29, Pt. 1.
 The Water Main Under New York Harbor.* J. F. Springer. (60) Sept.
 Rainfall in New England.* X. H. Goodnough. (28) Sept.
 Water Purification in Columbus, Ohio. Charles P. Hoover. (60) Sept.
 Public Water Supplies. Percy Griffith. (Paper read before the Birmingham Univ. Eng. Soc.) (104) Serial beginning Sept. 24.
 The Canadian Pacific Railway Irrigation System in Alberta.* (96) Sept. 30.
 St. Francis River Storage Dam.* (96) Sept. 30.
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- Old Wooden Turbine Tested.* Clinton B. Stewart. (13) Oct. 7.
 Intensity of Rainfall Studied at Columbus, Ohio.* Charles Herrick. (13) Oct. 7.
 Concreting Methods and Records, Elephant Butte Dam.* E. H. Baldwin. (13) Oct. 7.
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 The Development of Rapid Sand Filters in Ohio. Philip Burgess. (Paper read before the Central States Water Works Assoc.) (86) Oct. 27.
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- Movable Dams. H. B. Mucklestone. (5) Vol. 29, Pt. 1.
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